Pacific Surfliner Corridor
Los Angeles to San Diego
• Service Development Plan •

California Department of Transportation
August 2010

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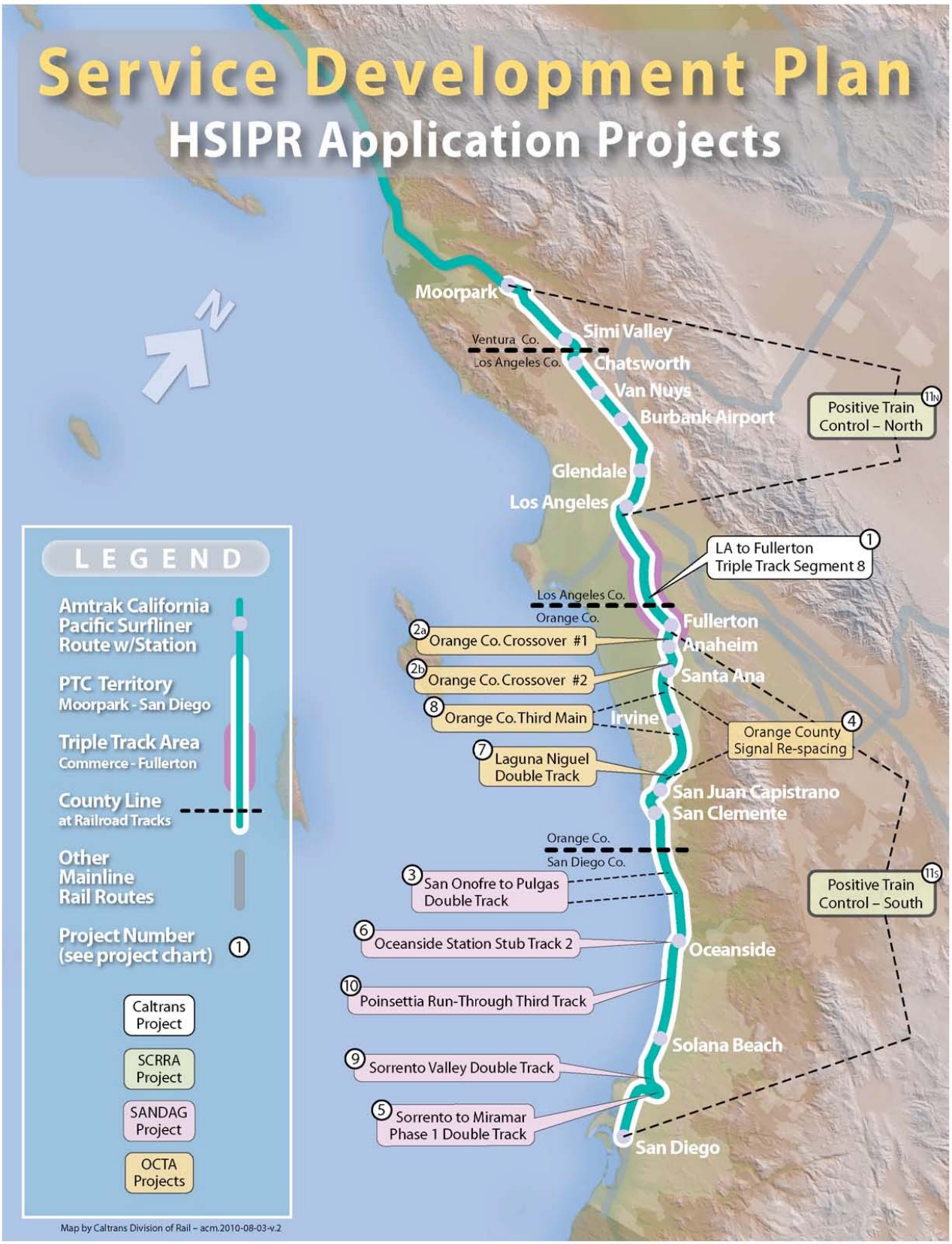


1.0 Purpose and Need

1.1 Background

The 351-mile-long Pacific Surfliner Corridor (also known as the LOSSAN Corridor) is the second busiest intercity passenger rail corridor in the U.S., second only to the Boston-to-Washington DC Northeast Corridor. More than nine million passengers make trips on LOSSAN Corridor trains annually. Looking toward a future of population increases; higher gasoline prices, more congestion on parallel highway systems, and longer commutes, the demand for the corridor's rail service is projected to grow.

The LOSSAN Rail Corridor Agency (LOSSAN) "is composed of elected officials representing rail owners, operators, and planning agencies along Amtrak's Pacific Surfliner corridor between San Diego and San Luis Obispo. The objective of the agency is to coordinate planning and programs that increase ridership, revenue, reliability, and safety on the coastal rail line from San Luis Obispo to Los Angeles to San Diego[1]."

There are four different corridor passenger rail services along this corridor (See Figure 1):

- The *Pacific Surfliner*, operated by Amtrak with financial support from the Department of Transportation (Department) Division of Rail, between San Diego and San Luis Obispo. The Department pays 70% of Pacific Surfliners costs above fare revenue. Amtrak contributes 30%, for the frequencies that were in place prior to the Departments support.
- The *Metrolink* commuter rail service, operated by the Southern California Regional Rail Authority (SCRRA) between Oceanside and Montalvo, north of Oxnard.
- *COASTER* commuter rail, operated by North County Transit District (NCTD) between San Diego and Oceanside.
- Amtrak Long Distance Services: the *Coast Starlight* operating between Seattle, Northern California and Los Angeles; and the *Southwest Chief* operating between Chicago and Los Angeles.

Right of way in the corridor is owned by the Los Angeles County Metropolitan Transportation Authority (MTA), Orange County Transportation Authority (OCTA), North County Transit District (NCTD) and the San Diego Metropolitan Transit System (MTS). Amtrak has trackage rights through master agreements with NCTD, OCTA, MTA and MTS.

There are three freight rail operators on the LOSSAN Corridor, sharing track with passenger trains. The Union Pacific Railroad (UP) serves customers between San Luis Obispo and Los Angeles. The Burlington Northern Santa Fe Railway (BNSF) runs trains between Los Angeles, Fullerton, and San Diego. Both UP and BNSF are major railroads, known as Class 1's. A short line or small railroad, the Pacific Sun Railroad, serves local customers in the Oceanside area. On a typical weekday, there are as many as 100 trains per day on the busiest segment of the corridor, between Redondo Junction near Downtown Los Angeles and Fullerton. Of these, half are passenger trains.

1.2 Purpose and Need

The purpose of the Pacific Surfliner Corridor Service Development Plan is to help meet the projected increase in travel demand for the next 20 years between the cities of Los Angeles and San Diego; to substantially reduce the travel time; increase reliability; and to increase the safety and accessibility of passenger rail service throughout the corridor.

[1] http://www.lossan.org

The Department is seeking design, environmental, and construction funding as a supplement to existing/programmed State and local funds to implement the projects described in two FY 2010 HSIPR Service Development Program grant funds applications. Those projects are described later in this document in Chapters 3 and 8 and are referred to as the Pacific Surfliner Capacity Enhancement Program and the Pacific Surfliner Corridor Positive Train Control (PTC).

The Capacity Enhancement Program addresses the long-term vision for the corridor by constructing 31 miles of double or triple track. The Pacific Surfliner Corridor PTC program will install PTC on the publicly-owned rights-of-way in the Pacific Surfliner Corridor from Moorpark to San Diego.

In 2007, the State of California and Federal Railroad Administration (FRA) completed the LOSSAN Program Environmental Impact Report / Environmental Impact Statement (PEIR/EIS) for the Los Angeles to San Diego segment of the corridor. (The Record of Decision was received from FRA in February 2009.) This Service Development Plan is consistent with the purpose and need of that document, which called for additional rail improvements as a way to help meet the Southern California region's transportation demands of today, as well as help to address the expected increase in intercity travel demand rising out of the growth in population over the next 20 years and beyond. Adding track capacity along key segments of the rail corridor will make these improvements possible.

Both the LOSSAN PEIR/EIS[2] and the 20-year LOSSAN Corridor Strategic Plan (October 2003)[3] describe the vision for this corridor and the need for capital investments. Additionally, the annual Business Plan and the 10-year California State Rail Plan (2007-08 to2017-18) both contain a constrained capital program and a discussion of the projected expansion of intercity passenger service.

As described in the LOSSAN PEIR/EIS and the LOSSAN Corridor Strategic Plan, the need for the improvements is demonstrated by Southern California's insufficient capacity to meeting existing and future travel demand in the transportation corridor, as well as deal with air quality concerns, reduced rail reliability, and increased travel times due to the associated congestion that arises from these capacity constraints.

1.2.1 Corridor Capacity Constraints

The interstate highway system and the existing passenger rail system serving the intercity travel market are currently operating at or near capacity, and have not been keeping pace with the increase in population and tourism in the state. In fact, over the past three years the Department and Amtrak have documented more than 50,000 standees on Pacific Surfliner trains during peak hour and seasonal peak periods. These passengers have paid full price for a seat but often cannot find an available seat during peak travel demand periods. This has impacted the quality of service with many first time riders indicating they are unlikely to return for a future trip on the train.

Additional needs for improvements to the corridor relate to the following:

- Future growth in travel demand for passenger trips between Los Angeles, Orange and San Diego Counties and other urban areas along the rail corridor.
- Rail capacity constraints resulting in congestion and travel delays.
- Rail capacity constraints due to single track.
- Unreliability of travel stemming from congestion, delays, weather conditions, accidents and other factors.
- Maximizing the cost-effectiveness of state-supported intercity rail services.

[2] Caltrans, LOSSAN Program Environmental Impact Report/Statement (2007)

[3] LOSSAN Corridor Strategic Plan (October 2003)

- Accidents on intercity highways and railways in congested travel corridors, and the potential for accidents at at-grade crossings as highway and rail traffic volumes increase.
- Continuing air quality issues associated with increasing number of motor vehicles.
- Pressures on natural resources and habitats from highway construction and motor vehicle use.

In the LOSSAN Corridor Strategic Plan, capacity constraints are discussed for track and signal systems, single track bridges, hand-thrown switches, and restricting topographic features such as bluffs and coastal areas dominated by curves that reduce train speeds.

Various segments of the LOSSAN corridor are currently constrained by the lack of adequate passing or second main tracks. For example, in San Diego County, 50% of the rail corridor is comprised of a single main line track. Another segment, between Los Angeles and Fullerton Junction, has a typical daily total exceeding 100 total trains. This segment has been improved in recent years by completing a portion of triple track and signal improvements in part funded by Track 1a.

Locations in San Diego County where the rail corridor is particularly constrained include the Del Mar Bluffs, Rose Canyon, Miramar Grade, and several lagoons between Miramar and Oceanside. These are single main track locations where there are significant distances between passing sidings, thus impacting the corridor's capacity and on-time performance.

North of Los Angeles, the segment between Ventura and San Luis Obispo counties is constrained by the primarily single track main line. Approximately 70% of this segment remains single track today.

In addition to the track capacity limitations, there are deficiencies in the current signal systems. Most of the rail corridor between Moorpark in Ventura county and San Luis Obispo county does not include Centralized Traffic Control (CTC), thus railroad dispatchers must approve train movements in signal blocks via radio instructions and this results in daily delays as train engineers are required to wait for authority to proceed into the next signal block. Also, in portions of the route between Los Angeles and San Diego the supplemental signal system (data radio) is antiquated and has an adverse impact on the on-time performance.

Further, the coastal topography with its river crossings and curves results in less than optimal train speeds, and in some locations there is space for only one track. Thus, there is more emphasis on improving track capacity and signal systems where tangent track and less restrictive locations permit.

1.2.2 Current and Forecasted Demand

In July 2007, the California Department of Finance (DOF) completed its latest projection of population increases and anticipated highway vehicle miles traveled (VMT) for the state[4]. The current California population total is approximately 38 million people and by 2020 this total is expected to increase to 44 million, an increase of 15.7%. The projection from DOF for VMT increases in California indicate 26% growth, comparing year 2010 (345.5 billion miles) to 2020 (436.4 billion miles).

A comparison of recent increases in intercity rail travel to VMT and population growth is included in the following table. The data for years 2000 to 2008 indicate that, while growth continues for California's population and VMT, intercity travel on the three state-supported rail corridors is increasing at an even higher rate. With the investment of additional improvements in the rail system, rail travel will become more attractive to intercity travelers and result in further ridership increases on the state-supported trains.

[4] http://www.dof.ca.gov/research/demographic/reports/projections/

Table 1 — Comparison of Population, Vehicle Miles Traveled, and Rail Ridership Route Total Growth 2000-2009

California State Population				California Vehicles Miles Traveled (VMT)			
Dates	**Population**	**Growth**	**% of Growth**	**Dates**	**VMT CA (Billions)**	**Growth**	**% of Growth**
7/1/2000	34,095,209			12/31/00	306.643		
7/1/2001	34,766,730			12/31/01	314.549	7.906	2.58%
7/1/2002	35,361,187	594,457	1.74%	12/31/02	321.504	14.861	4.85%
7/1/2003	35,944,213	1,177,483	3.45%	12/31/03	324.035	17.392	5.67%
7/1/2004	36,454,471	1,687,741	4.95%	12/31/04	328.641	21.998	7.17%
7/1/2005	36,899,392	2,132,662	6.26%	12/31/05	327.446	20.803	6.78%
7/1/2006	37,298,417	2,531,687	7.43%	12/31/06	329.775	23.132	7.54%
7/1/2007	37,712,588	2,945,858	8.64%	12/31/07	335.221	20.672	6.57%
7/1/2008	38,134,496	3,367,766	9.69%	12/31/08	325.755	4.251	1.32%

Amtrak California Ridership							
Dates	**Ridership**	**Growth**	**% of Growth**	**State Fiscal Year**	**Pacific Surfliner**	**San Joaquin**	**Capital Corridor**
6/30/00	2,922,947			1999-00	1,567,318	671,295	684,334
6/30/01	3,403,374			2000-01	1,661,704	710,833	1,030,837
6/30/02	3,566,633	163,259	4.80%	2001-02	1,742,768	733,152	1,090,713
6/30/03	3,929,882	526,508	15.47%	2002-03	2,030,491	769,708	1,129,683
6/30/04	4,207,284	803,910	23.62%	2003-04	2,307,010	752,227	1,148,047
6/30/05	4,436,723	1,033,349	30.36%	2004-05	2,454,396	743,245	1,239,082
6/30/06	4,726,696	1,323,322	38.88%	2005-06	2,655,490	801,242	1,269,964
6/30/07	4,875,342	1,471,968	43.25%	2006-07	2,685,194	789,641	1,400,507
6/30/08	5,326,868	1,923,494	56.52%	2007-08	2,835,132	894,346	1,597,390
6/30/09	5,326,696	1,923,322	56.51%	2008-09	2,696,951	958,946	1,670,799

Amtrak California Passenger Miles							
Dates	**Passenger Miles**	**Growth**	**% of Growth**	**State Fiscal Year**	**Pacific Surfliner**	**San Joaquin**	**Capital Corridor**
6/30/00	302,473,904			1999-00	146,951,855	104,298,106	51,223,943
6/30/01	335,134,836			2000-01	155,568,815	110,245,152	69,320,869
6/30/02	349,906,949	14,772,113	4.41%	2001-02	161,288,110	114,774,183	73,844,656
6/30/03	367,769,688	32,634,852	9.74%	2002-03	172,035,383	119,660,241	76,074,064
6/30/04	385,623,385	50,488,549	15.07%	2003-04	191,704,004	116,368,190	77,551,191
6/30/05	395,667,246	60,532,410	18.06%	2004-05	197,547,391	113,818,370	84,301,485
6/30/06	425,335,676	90,200,840	26.91%	2005-06	216,977,249	121,578,058	86,780,369
6/30/07	433,004,632	97,869,796	29.20%	2006-07	220,692,812	119,013,990	93,297,830
6/30/08	469,855,783	134,720,947	40.20%	2007-08	234,041,561	131,111,652	104,702,570
6/30/09	449,650,538	114,515,702	34.17%	2008-09	213,655,854	133,711,704	102,282,980

* VMT data available through 2009.

Sources: Population stats from DOF web site. VMT stats from Caltrans Division of Transportation System Information, Rail Ridership and Passenger Miles from DOR Statistics

1.2.3 Capacity of the Intercity Transportation System

Figure 1 illustrates the major freeways, rail routes and airports currently being utilized for intercity travel within the Southern California region. The growing population and economic activity in Southern California has placed severe demands on the already congested transportation system serving the area. Many of the highways and airports are currently operating at capacity and current plans for expansion will not keep up with projected growth over the next 20 years and addressed earlier in this document, the three rail services along the LOSSAN corridor are constrained by a corridor that is significantly undersized for the volumes of traffic it accommodates.

1.2.4 Safety

Because of its complicated operating characteristics associated with the numerous users of this rail corridor, the FRA has identified Southern California as a national priority area for the implementation of PTC.

PTC is a predictive collision avoidance technology designed to stop a train in motion where the continued movement may result in an accident. The safety enhancing goals of PTC are to help prevent train-to-train collisions, speeding and over-speed derailments, incursions into track work zones, and movement of a train through a switch left in the wrong position. Relying on sophisticated new technology, PTC is designed to keep a train under its maximum speed limit and within the limits of its authorization to be on a specific track. The GPS-based PTC technology is designed to improve the safe operation of passenger and freight railroads. The primary benefits of PTC include saving the lives of train crews, passengers, and railroad workers, improving passenger and freight train operational efficiency and providing real-time train location information. The total PTC project cost for the publicly owned rights-of-way and equipment in southern California is estimated to be $290.9 million.

The Rail Safety Improvement Act of 2008 mandates the installation of PTC on passenger rail systems. The southern California railroads face a substantial risk that the rail system will be shut down by the FRA for violation of safety laws due to the fact of PTC not being implemented in a timely manner. The Notice of Proposed Rule Making (NPRM) issued by the FRA on July 21, 2009, states that after December 31, 2015, no passenger rail service may continue or commence until a PTC system certified under subpart I has been installed - 74 Fed. Reg. 36013-14 (adding 49 CFR 236.1005(b) (5)). All of the operating railroads in the corridor listed above will benefit from the implementation of PTC and would have to cease operations after December 31, 2015, if PTC were not in place. PTC will also be essential if the corridor is to see any speed increases as the state continues to implement High-Speed Rail/IPR service.

1.2.5 Other Rail Corridor Users

The operational benefits from this Service Development Plan would be shared with freight trains and other rail corridor users. Freight trains in the project area are operated by the BNSF under shared-use agreement with NCTD and with the SCRRA member agencies; and with the UP under shared use agreements with the SCRRA member agencies. These agreements and services would be maintained after the project is completed. The COASTER commuter rail and Metrolink Ventura County, Antelope Valley, 91 line, Orange County and Inland Empire-Orange County (IEOC) Lines, may also benefit from the improved reliability and on-time performance, reduced travel time, and enhanced safety.

Any improvements on the corridor would build upon an already strong intercity passenger rail network that includes connections to local bus and/or rail service at nearly every station. In addition, the passenger rail service on the corridor will act as an important feeder to the California High-Speed Train through connections at the Anaheim Regional Intermodal Transportation Center (ARTIC) in Anaheim and downtown San Diego. When the high-speed trains enter revenue service, both Amtrak Pacific Surfliner and commuter services will feed into the statewide system, allowing communities not along the statewide high-speed corridor to be connected to the service. This SDP addresses improvements in all these areas and would make

rail travel a more attractive transportation alternative in the corridor. The California High-Speed Rail Authority (CHSRA) is currently evaluating alternative alignments and potential environmental impacts.

2.0 Rationale

The LOSSAN Rail Corridor is one of the busiest, most important rail lines in the United States, and serves a vital function in providing intercity, commuter, and freight rail services within and between cities in California's most populous counties.

Southern California's existing transportation network is currently operating at or near its design capacity, and building additional capacity is both expensive and increasingly problematic. This results in highway and railroad travel delays, has a negative impact on the region's economy, and can result in environmental impacts and the reduction of the quality of life for all. Improvements to the LOSSAN rail corridor would help meet the Southern California region's transportation demands of today, as well as help to address the expected increase in intercity travel demand rising out of the growth in population over the next 20 years and beyond.

Improvements to the LOSSAN rail corridor would improve passenger rail travel between the Los Angeles, Orange and San Diego County major metropolitan areas; provide for a better interface with transit and highways; and provide added capacity within a multimodal strategy to help meet increases in intercity travel demand in Southern California in a manner sensitive to and protective of California's unique natural resources. The overall goal is to improve mobility and reliability in this congested part of the state by decreasing trip times and improving the rail system in a cost-effective and environmentally sensitive manner.

Intercity passenger rail stations in the project area that will benefit from the corridor program include: Los Angeles Union Station, Fullerton, Anaheim, Orange, Santa Ana, Irvine, Laguna Niguel/Mission Viejo, San Juan Capistrano, San Clemente Pier, Oceanside, Solana Beach and San Diego, as well as two Metrolink commuter rail stations in Orange County, and five COASTER commuter rail stations in San Diego County. The Los Angeles Union Station terminal area is the busiest rail terminal west of the Mississippi and processes over 300 daily passenger and freight moves including 40 daily intercity passenger trains and all Amtrak long-distance trains serving Los Angeles as well as direct connections to Los Angeles Metro Red and Gold rail lines. Growth over the next 10 years is anticipated at approximately 30 percent.

Connectivity to High-Speed Rail: Amtrak, Metrolink and COASTER will all act as important rail feeder services to the future California High-Speed Rail system, transporting passengers from San Diego, Riverside, San Bernardino and Orange counties to either the Anaheim Regional Transportation Intermodal Center (ARTIC), the southern terminus of the initial segment of the statewide high-speed train route or LAUS, a key rail hub for high-speed, intercity, and commuter passenger rail services.

Cost-Effectiveness: The Pacific Surfliner Capacity Expansion Program has independent utility, and is not dependent on completion of other corridor programs to be successful and provide measurable benefits to intercity rail service. The corridor program will improve the cost-effectiveness of intercity passenger rail operations in the corridor by reducing travel time, improving on-time performance, enhancing safety, and increasing the maximum authorized speed for passenger trains.

2.1 Operational Benefits

As described in Chapter 6, the operations simulation modeling shows that the proposed capital program will produce operational benefits, including reductions in train travel times, improved on-time performance, speed increases, and the additional track capacity needed to increase train frequencies.

2.1.1 Safety and Positive Train Control

Implementing Positive Train Control (PTC) will serve as an important step to sustain a robust passenger rail transportation network that improves operational reliability, increases speed and capacity throughout the region. Attracting more customers to both intercity and commuter rail through improved performance will offer a key mobility choice for Southern Californians. As a result, passenger rail service enhances mobility and provides viable transportation options, removes cars from adjacent freeways, improved air quality and reduces congestion in the Southern California region. A recent Texas Transportation Institute "Urban Mobility Report" has reported Southern California to have the worst congestion in the nation.

A benefit-cost analysis was conducted using the California Lifecycle Benefit/Cost Analysis Model (Cal-B/C). The PTC system is likely to improve train operations. The benefit-cost assessment assumes that there is a one minute improvement in in-vehicle travel time per person resulting in a benefit over 20 years of $28.4 million at 7 percent discount rate and $44.7 million at 3 percent discount rate. This represents 8 percent of the calculated benefit of PTC. Likewise, PTC will lead to better schedule adherence and improved traveler information. These will allow travelers to schedule station arrivals with less waiting time. The benefit-cost assessment assumes a one minute reduction in station waiting time per passenger resulting in a benefit over 20 years of $56.8 million at 7 percent discount rate and $89.3 million at 3 percent discount rate. This represents 16 percent of the calculated benefit of PTC. The combination of better safety, schedule adherence, and traveler information is likely to increase ridership. The benefit-cost analysis assumes that ridership increases by 2 percent as a result of PTC resulting in a benefit over 20 years of $53.6 million at 7 percent discount rate and $84.4 million at 3 percent discount rate. This represents 15 percent of the calculated benefit of PTC.

3.0 Identification of Alternatives

The guidance provided by the FRA to develop a service development plan encourages the identification, consideration, and discussion of alternatives to the proposed action. Since the Pacific Surfliner service already exists and the expansion proposed is not outside the scope of what is already provided, there are no practical modal or routing alternatives for the region to better achieve the service expansion goals the Capacity Enhancement Program is seeking to provide. The benefits of implementing the incremental Capacity Enhancement Program as outlined in this document encompass reduced travel congestion, reduced delays, improved air quality, and improved travel options within the southern California region. To the extent that the increased time savings and service frequencies are layered atop the existing service in these areas, it allows the Pacific Surfliner to serve a greater base of travelers on any given day and there are no other modal alternatives at this time that provide a cost effective or socially acceptable alternative.

3.1 Alternatives Summary

Given the market size and importance of the existing Pacific Surfliner Corridor service, the examination of alternative modal solutions is not practical. The Pacific Surfliner Corridor service characteristics (route alignment, station locations, ease of utilizing the service, connections to local/regional transit, high ridership) are already established to serve and, once frequencies are increased, better serve the expansion in the corridor markets.

3.1.1 Previous Corridor Planning Studies

Since 1998, four planning and feasibility studies have been completed that are relevant to the LOSSAN corridor. The first of these was in conducted in 1998-1999 by the California High-Speed Rail Authority, building on previous work done in 1996 by the past California Intercity High-Speed Rail Commission. This study determined that dedicated high-speed rail service in the LOSSAN rail corridor south of central Orange County was problematic and costly to

construct[5]. The 1999 study also concluded that conventional (non-electric) rail improvements in the LOSSAN corridor should be further evaluated.

The Department and others prepared the second and third planning studies, addressing proposed capital improvements and service goals for the state rail system, including the LOSSAN corridor. These rail plans, Amtrak's California Passenger Rail System 20-Year Improvement Plan (2001) and the Department's California State Rail Plan (2002), helped form the basis for the Department's alternatives development, and led to the initiation of the LOSSAN Program Environmental Impact Report/Statement (PEIR/S).

The Department's Notice of Preparation for the PEIR/S was released March 11, 2002, and the Notice of Intent was published in the Federal Register on March 20, 2002. Scoping activities for the LOSSAN corridor were conducted between April 2 and April 30, 2002. The scoping process identified areas of potential concern related to the proposed LOSSAN corridor improvements. Throughout the corridor, comments consistently indicated the need for an improved transportation system focusing on safety and new alignments located away from environmentally sensitive areas.

Finally, the Department's LOSSAN Corridor Strategic Plan (2003) provided a corridor-wide review of all alternatives. This planning document served as a means to consider and refine alternatives in the ongoing PEIR/S process. A series of public workshops provided an additional opportunity for public outreach, beyond that provided during the Scoping Process, and fostered better communication and understanding among stakeholders. In addition to the public workshops, meetings with elected representatives were held, as well as with working groups comprised of transportation agencies and other stakeholders, including state and federal resource agencies, FRA, and the Authority.

The Strategic Plan served as the Department's alternative evaluation document, allowing for the elimination of certain design options at key locations within the corridor (San Juan Capistrano, Dana Point/San Clemente, Encinitas, Del Mar), so as to focus on a range of feasible alternatives. As well, through the Strategic Plan's consultative process, new alignments were presented by local working groups, leading to consideration of additional design options in San Juan Capistrano and Del Mar.

As stated in the purpose and need in the LOSSAN PEIR/S is to develop a faster, safer, and more reliable passenger rail system that provides added capacity in response to increased travel demand through the year 2020 between Los Angeles, Orange, and San Diego Counties (between Los Angeles Union Station and San Diego Santa Fe Depot).

As stated in the current State Rail Plan and the Strategic Plan, the Department has described its overall objectives and policies for intercity rail improvements. These objectives and policies include the following:

- Increase the cost-effectiveness of State-supported intercity passenger rail systems.
- Increase capacity on existing routes.
- Reduce travel times to attract additional riders and to provide a more attractive service.
- Improve the safety of State-supported intercity rail service.

In addition to the policies set forth in the State Rail Plan, minimizing impacts to natural resources (e.g. wetlands, wildlife habitat) and human communities are also important objectives of the Department regarding any improvement within the rail corridor. The capacity of Southern California's intercity transportation system (shown in Figure S.3-1) is insufficient to meet existing and future demand, and the current and projected future congestion of the system will continue to result in deteriorating air quality, reduced reliability, and increased travel times. The intercity rail system has not kept pace with the tremendous increase in

[5] "Dedicated" service would not share tracks with existing passenger and freight rail services.

population and tourism in the state. The interstate highway system and passenger rail system serving the intercity travel market are currently operating at or near capacity and will require large public investments for maintenance and expansion in order to meet existing demand and future growth over the next 20 years and beyond. Simply stated, the need for improvements to the corridor relates to the following issues:

- Future growth in travel demand for passenger trips between Los Angeles, Orange and San Diego Counties, as population increases from 16.6 million (2003) to 19.3 million by 2020, and trips rise from 36 million in 1997 to approximately 47 million by 20206.
- Rail capacity constraints that will result in congestion and travel delays. Roughly 41 percent of the corridor is currently single-tracked, causing delays for passenger and commuter rail services as well as freight movements.
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in Southern California. The improvements proposed in this document would increase on-time performance for rail services and reduce delay for both automobiles and trains.
- Increasing frequency of accidents on intercity highways and passenger rail lines in congested travel corridors, and the potential for accidents at at-grade crossings as highway and rail traffic volumes increase. While rail is already one of the safest modes of transportation, improvements such as new grade separations and pedestrian crossings will reduce auto-train accidents and improve safety.
- Poor and deteriorating air quality and pressure on natural resources as a result of expanded highway construction, motor vehicle use and congestion. Moving passengers by rail produces significantly less pollution per passenger mile than by automobile and can help reduce air pollution. As well, mitigating and reducing the impacts of rail service and protection of important coastal and environmental resources has been a consideration when selecting and evaluation improvements.

3.2 Alternatives

The Service Development Plan is based upon the Capacity Enhancement Program, described in Chapter 8. The Capacity Enhancement Program addresses the long-term vision for the Pacific Surfliner corridor by constructing 31 miles of double or triple track along the nation's second busiest intercity rail corridor. In addition, these capacity improvements are key to creating a network of commuter, intercity, and future high-speed rail services, by creating capacity for additional intercity rail services that will provide connections to the state's high-speed rail system. Specific benefits include improvements in on-time performance, travel time, and speeds, and the additional intercity passenger trains to the corridor.

[6] Charles River Associates Incorporated, *Independent Ridership and Passenger Revenue Projections for High Speed Rail Alternatives in California*, January 2000.

Table 2 — Capacity Enhancement Program

Project Number	Project Name	Agency	Project Cost (in $1000)
1	LA to Fullerton Triple Track	CA Dept. of Transportation	$12,169
2	Orange County Crossovers	OCTA	$7,934
3	San Onofre to Pulgas Double Track	SANDAG	$80,452
4	Orange County Signal Re-spacing	OCTA	$4,629
5	Sorrento-Miramar Ph 1 Double Track	SANDAG	$32,541
6	Oceanside Station Stub Track 2	SANDAG	$13,666
7	Laguna Niguel Double Track	OCTA	$48,992
8	Orange Co Third Main	OCTA	$80,828
9	Sorrento Valley Double Track	SANDAG	$37,574
10	Poinsettia Third Main	SANDAG	$13,572
11	CA-Pacific Surfliner-PTC (Moorpark to San Diego)	SCRRA	$53,571

These projects will provide additional track capacity and allow for future additional service, consistent with the state's intercity passenger rail improvement goals. As the customer experience is improved and additional service is available, ridership is projected to increase, and mobility will improve as cars are taken off the busy Interstate 5 and State Route 101 freeway corridors.

3.3 No-Action Alternative

The No-action alternative is the baseline for comparison of the rail Improvements alternative, and represents the LOSSAN region's transportation system (highway and conventional rail) as it would be after implementation of programs or projects that are currently programmed in Regional Transportation Plans (RTPs) and that are funded for implementation and expected to be in place by 2020. This financially constrained level of infrastructure improvement (which includes federal, state, regional, and local funding) is analyzed together with the significant growth in population and transportation demand that is projected to occur by 2020.

Additional modeling conducted after the release of the Draft document identified that the rail network will not be capable of supporting the rail service volumes proposed in the alternative. Further analysis identified the "Maximum Threshold" of train volumes that could operate under the No-Action Alternative at an acceptable level of performance, which represents a reduction of ten percent across intercity passenger rail, commuter rail, and freight rail services from the originally planned volumes. As well, additional minor improvement projects were identified to support the service levels, all of which can be accomplished within the existing rail right-of-way.

4.0 Planning Methodology

The Department and the FRA developed and evaluated alternatives through an iterative process that included the scoping process, independent planning and feasibility studies, considering work done by others, and referring to documents such as the LOSSAN Strategic Plan. Key criteria used to distinguish between alternatives include reliability and travel time, safety, connectivity, and ridership potential. In addition to these criteria, the alternatives had to be practicable and constructible, given right-of-way constraints and sensitivity to environmental and community impacts. The development of alternatives to be evaluated are described in the LOSSAN PEIR/EIS and were was based on all previous work related to the high-speed rail as well as two state rail plans; the California Passenger Rail System 20-Year Improvement Plan (2001) and the California State Rail Plan (2002). The formal environmental process for the LOSSAN corridor began in early 2002, and included public and agency coordination and scoping, on-going agency involvement and working groups, and development of a Strategic Plan for the LOSSAN corridor.

This program is consistent with the California State Rail Plan (2007-2008 to 2017-2018), which identifies the specific programs and policies to implement the long-term corridor vision. In 2009; two complementary corridor-specific planning studies were completed. First, NCTD; San Diego Association of Governments (SANDAG); Amtrak; BNSF, and the Department completed a detailed prioritization study of 40 rail projects along the San Diego portion of the corridor. Each project was evaluated on a series of criteria, rail performance being the most heavily weighted. Other criteria included cost, project delivery, environmental, community, and safety. Double tracking projects included in this corridor enhancement program ranked in the top 20 percent in this analysis. Second, OCTA worked with Metrolink and the Department to complete a technical memorandum in July 2009 that identified track and signal projects necessary to enhance the Pacific Surfliner corridor through reduced travel times, improved reliability and safety, and expanded capacity and accessibility. Each of the projects included in this corridor program was identified in the technical memorandum as a project that would improve passenger rail operations and have corridor wide benefit.

4.1 Planning Horizon (year)

Current intercity passenger rail planning on the Pacific Surfliner is documented in the California State Rail Plan (2007-2008 to 2017-2018) which defines the Departments ten year vision from 2007-08 to 2017-18. The planning horizon used for the modeling efforts was 2015-16.

4.2 Major Cross-cutting Assumptions

There is tremendous variation in the nature of the built and natural environments along the LOSSAN corridor between San Diego and Los Angeles. The rail line traverses some of California's most scenic and environmentally-sensitive areas, including extended portions directly adjacent to the Pacific Ocean, thus opportunities for expansion are limited.

4.2.1 Topography and Wetlands and Water Resources

Expansion of rail right-of-way is constrained by topography along much of the Pacific Surfliner Corridor. The Pacific Surfliner runs along the coast between San Clemente to San Diego. Immediately to the east of the rails are steep cliffs and directly to the west is the Pacific Ocean.

In addition, that area has numerous lagoons and sensitive wetlands that are crossed by the rail line. Impacts to wetlands and the corresponding protected species that inhabit the wetlands are extremely problematic.

4.3 Public Involvement

The Department's early definition of the project and characterization of a feasible range of alternatives to be carried forward in the LOSSAN PEIR/EIS involved frequent coordination with public agencies and the general public. Prior to the Department's separate environmental process initiation, potential improvements to the LOSSAN corridor had been included in the agency and public involvement processes sponsored by the LOSSAN Joint Powers Authority. Additional agency and public input was obtained during the Department's scoping process pursuant to CEQA and NEPA requirements. The Department's Notice of Preparation (NOP) of the LOSSAN PEIR/EIS was released March 11, 2002, and the Notice of Intent (NOI) was published in the Federal Register on March 20, 2002. Written responses were received from interested parties in response to these notifications. The scoping activities for the LOSSAN PEIR/EIS were conducted between April 2 and April 30, 2002 (scoping period). A LOSSAN regional agency and public scoping meeting was held on April 2, 2002 in Los Angeles to obtain public and agency input. A series of six additional scoping meetings followed throughout the region as well as other meetings, briefings, and involvement activities conducted jointly by the Department and the LOSSAN joint powers authority.

The scoping process identified areas of potential concern related to the proposed LOSSAN corridor improvements. Throughout the corridor, comments consistently indicated the need for an improved transportation system focusing on safety and new alignments located away from environmentally sensitive areas. The concerns with respect to environmental issues typically focused on potential noise and visual impacts, and impacts on air quality and sensitive habitats. The scoping process and outcomes are documented in the LOSSAN Proposed Rail Corridor Improvements Study – Public Scoping Report and summarized in the LOSSAN PEIR/EIS.

4.4 Agency Involvement

Following the response to the NOP and NOI and a series of public scoping meetings, the Department and FRA (as the lead CEQA and NEPA agencies responsible for the preparation of the PEIR/EIS) formed a working group of representatives comprised of eight key federal and state agencies to assist in the environmental review process. The interagency group met periodically during the PEIR/EIS development to discuss major issues from the perspective of each of their agencies and to provide input to the lead agencies and consultant team to help focus the analysis and streamline the review process. The federal and state agency representatives have been included in this process to provide input and timely review for the following specific areas:

- Define the scope of the PEIR/EIS
- Review and provide input to the Purpose and Need Statement
- Review and provide input to the technical methods of analysis and study area definition
- Identify substantive issues of particular concern
- Suggest sources of information and data relevant to their agency
- Define avoidance, minimization and mitigation strategies
- Review and provide input to the screening process and definition of alternatives to be analyzed in the PEIR/EIS
- Review and provide input on preliminary findings pertinent to agency expertise
- Identify procedural requirements and permits or approvals necessary for subsequent phases of environmental review.

The Department, together with FRA and the LOSSAN joint powers authority, also invited input from regional and local agencies within the project area. Regional transportation agency Board meetings and working-group meetings provided forums for discussion of the environmental process and the development of alternatives that could meet travel needs in the LOSSAN

region. These meetings were held in San Diego, Oceanside, Orange County and Los Angeles to provide convenient on-going opportunities for regional and local participation and input.

5.0 Demand and Revenue Forecasts

The intercity rail passenger ridership model is used by the Department and Amtrak to estimate the ridership and revenue impacts of major service changes, such as new services, route extensions or truncations, frequency changes, and fare changes, as well as to help project future ridership and revenue on existing services. Amtrak and the Department utilized the services of AECOM to run the intercity rail passenger ridership model to project the ridership and revenue results that would occur from transportation benefits once the capital program was implemented. The capital projects would be completed over time and the projected results are consistent with the anticipated completion dates.

5.1 Demand Forecasts

5.1.1 Methodology

The ridership/revenue model is responsive to all of the following parameters:

- Station stop locations
- Train travel times
- Train departure/arrival times/time-of-day
- Frequency (number of trains)
- Rail fares/yields
- Competing auto travel time & cost
- Future growth rates

5.1.2 Study Area defined

The model study area to analyze the ridership and revenue effects of implementing the Capacity Enhancement Program encompass the Pacific Surfliner Corridor and surrounding communities. The model includes modes from intercity passenger rail, auto (private vehicle), and air (relevant for Northern – Southern California market).

5.1.3 Data Sources

5.1.3.1 Existing Travel Market

The key model inputs are provided by Amtrak/Caltrans train timetables and fares. As well, the statewide highway network for access to/from stations and for competing auto travel plays a vital role. Also, population data and forecasts from the State of California are incorporated.

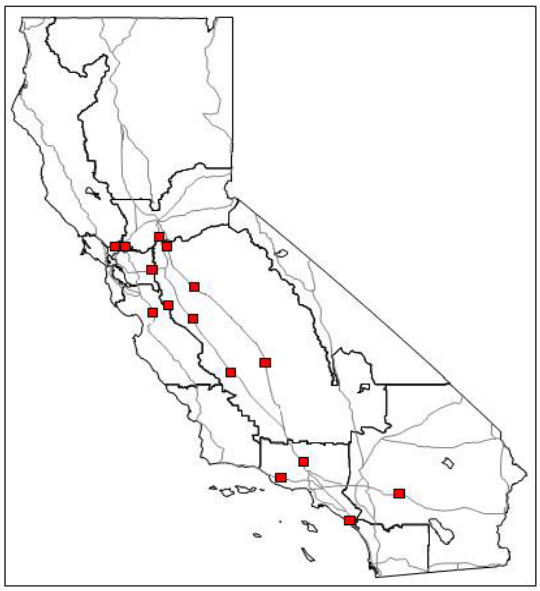
Variables in the travel market growth include population, income, and employment. Variables in the travel market share include travel time, line haul, access/egress, travel cost, and frequency (number of trains and departure/arrival times-of-day). The model also accounts for trip purpose market segments across commute, business, recreation and other categories. As a matter of practice, each origin-destination market is analyzed with a separate set of calculations by trip purpose.

Highway traveler data were obtained through both license plate surveys and rest area surveys. The license plate survey technique involved videotaping license plates, reducing that data and entering in observed plates, obtaining addresses from California Department of Motor Vehicles and mailing surveys. Completed surveys were returned by mail and key-entered or, the respondent had an option to complete survey by internet. The rest area survey technique involved direct interview with travelers in a rest area. Data were collected and entered during

the interview. These interviews were best suited for lower volume semi-rural locations where local traffic was not as significant. In total there were over 100,000 completed surveys of auto travelers from the locations as depicted in Figure 3.

Figure 3 — California Ridership/Revenue Model – Highway Survey Locations

- **Northern/Central California**
  - I-80/680 in Solano County
  - I-580 near Altamont Pass
  - Route 152 near Pacheco Pass
  - US 101 south of Gilroy
  - I-5 & Route 99 near Lodi (Sacramento-Stockton)
  - Rest Areas on I-5 & Route 99 within the Central Valley
- **Southern California**
  - I-5 near Santa Clarita
  - US 101 near Camarillo
  - Rest Areas on US 101
  - I-5 near Oceanside
  - I-15 near Mission Rd, San Diego Co.
  - I-10 near Beaumont



For train traveler surveys, self-administered survey forms were distributed to passengers on-board Amtrak California Trains. These were collected and completed surveys were key-entered. Over 25,000 completed surveys were received from rail travelers.

Survey content for both the highway and rail surveys consisted of the following categories of data:

- Origin & Destination
- Location (5-digit zip code)
- Type/trip purpose
- Departure/arrival times
- Group Size / Vehicle Occupancy
- Trip Frequency
- Traveler Characteristics
- Age & gender
- Household Characteristics
- Size
- Number of vehicles
- Annual income

Travel service characteristics are the key independent variable in the model, including travel time, travel cost, frequency (for rail) and time of day. The Department's geographic information system (GIS) based intercity highway network provided the basis for highway travel times, distances and costs. The intercity rail travel characteristics are based on published timetables as well as ridership and revenue data provided by both the Department and Amtrak. Highway and rail surveys provide the basis for quantifying the existing travel market. Between 1992 and 2006, over 700,000 auto and rail surveys were distributed across California, with over 130,000

surveys returned. The goal of both sets of surveys was to understand the travel patterns and develop demographic profiles for intercity travelers within California. This information is used in guiding the strategic planning process by which annual marketing plans are developed.

Additional Amtrak market research and analysis was conducted, both in California and nationally, including an analysis of historical demand, elasticity of price and frequency changes. An additional study of parking, on-time performance and business class was performed on the *Pacific Surfliner*. Amtrak ridership and ticket revenue by station pair, train and route including connecting train and thruway bus riders and air passenger data were incorporated into the model.

The model has been improved over time to be sensitive to changes in train departure/arrival times. This revision incorporated parameters including new time-of-day factors, departure time from origin station, arrival time at destination station and train spacing/coverage. The improved model did not require changes to the initial travel time and fare sensitivities. The revised model also accounts for thruway bus service schedule changes.

The Department works with Amtrak to set fares, usually twice per year. Ticket types include standard one-way, round trip, 10-ride tickets (valid for 45 days) and monthly passes. The monthly and multi-ride tickets can be used year-round for all regularly scheduled train service. The current fare structure is based on a one-way tariff, with the roundtrip tariff equal to double the on-way tariff. Discount fares are available to seniors, students, military personnel and children under 15. Amtrak also provides reduced fares for certain national partners, such as American Automobile Association (AAA) members. The *San Joaquin* route employs a reservation and revenue management system. Passengers reserving early get a lower fare, while higher fares apply closer to train departure as the train fills up. The *Pacific Surfliner*, however, is unreserved with a single-level fare system.

5.1.3.2 Forecast Year Travel Market

The model baseline year is 2011. The years of interest examined for this Service Development Plan (SDP) are 2014, 2018, and 2023. The AECOM California Model was run for both ridership and revenue.

Assumptions for the model run were:

- No new frequencies.
- Use existing schedules (adjusted for running time decrease)
- On-time performance (OTP) from actual in 2010 up to 85% in 2011-12, then increase by 1% each year until OTP reaches 90%.
- Market growth based on California Department of finance population figures.
- Ticket increase assumed to be 2% per year assumed to match inflation.
- Los Angeles – San Diego trip time decrease to 2.5 hours for 2013-14 and to 2.4 hours from 2015 to 2025.
- Los Angeles – San Luis Obispo trip time decrease to 5.0 hours for 2013-14 and to 4.9 hours from 2015 to 2025.
- As per the model standard, OTP impacts reflect a six-month delay in market response.

The Department's assumptions for determining the influence of the project on ridership and revenue growth is based solely on market-share forecasts. On-time performance and travel time parameters were deemed to influence ridership and revenue due to building of capital projects specified in this Service Development Plan.

Travel Model

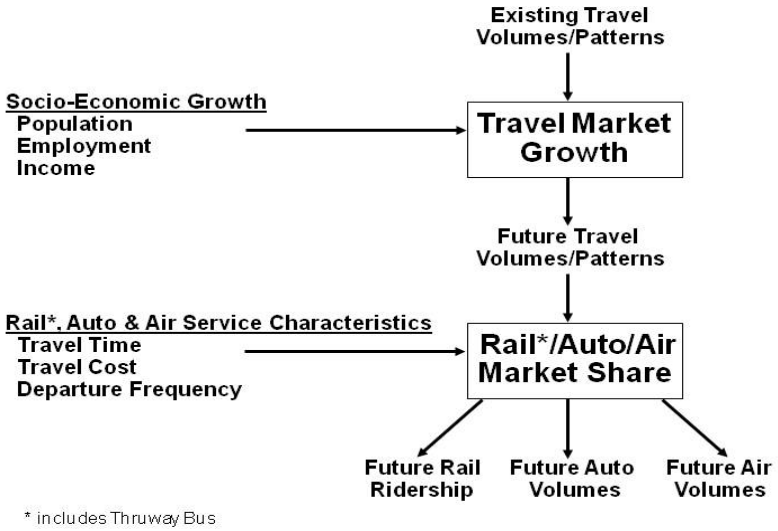
The basic model development steps used input from conducted travel surveys, socio-economic data and survey data, and the development of service parameters/assumptions. From this the travel demand models were run with key Inputs being rail service characteristics, train schedules, travel time, frequency (departure/arrival times-of-day), revenue yield/fares, station access (highway time and cost), competing auto and air service characteristics, and socio-economic data and forecasts. Population data from California Department of Finance and employment and income from various local and state sources was also incorporated.

The first stage of the model predicts total travel volumes for each origin/destination pair. The second stage predicts the share of intercity travel that is expected to use each available modal alternative (automobile, rail) in the future. Both model stages are conditional on the characteristics of the modal services to be offered and the characteristics of the population. The model is consistently checked for accuracy through comparison of incremental ridership and revenue forecasts of near term service changes with the actual ridership and revenue increments resulting from the initiative.

5.1.4 Travel Demand Model Structure

The structure of the model is best illustrated as shown in Figure 4. The model inputs described above are maintained, updated, and the parameters which change; frequencies, station stops, and scheduled travel locations, and future years, are inputted and the model structure or relationships calculates the changes to revenues and ridership.

Figure 4 — Structure of the Model



5.1.4.1 Mode Choice Model Structure

The mode choice model structure uses a nested choice model where automobile, air and finally rail mode choices are made. It makes use of the data parameters mentioned above in selecting the mode of travel.

5.1.4.2 Model Calibration and Validation

This model was calibrated to match observed shares for selected city pairs and then the results were validated for the respective California corridor markets included in the model. The travel market drivers include the variables of:

- Travel Time (weighted by component)

- Line Haul
- Access/Egress
- Travel Cost
- Frequency (departure/arrival time-of-day)

The drivers for trip purpose segments included commute, business, recreation, and other. Table 3 describes the travel market growth drivers for California corridors.

Table 3 — California Ridership/Revenue Model Trip Purpose and Variable Business Drivers

	Trip Purpose Segment			
Variables	**Commute**	**Business**	**Recreation**	**Other**
Population (home)	X	X	X	X
Population (non-home)				X
Income			X	
Employment	X	X	X	X

5.1.4.3 Base and Future Year Models

The base year for *Pacific Surfliner Corridor* service is FY 2011. Example years chosen to illustrate market-share increases that show the need for the Capacity Enhancement Program are 2014, 2018 and 2023.

5.2 Revenue Forecasts

5.2.1 Model Forecasts

Amtrak with AECOM consulting ran the model based on *Pacific Surfliner* schedules, crew turns, and assumptions discussed above. The resulting ridership and ticketing revenues, and additional revenues, are processed by Amtrak to develop detailed expense categories. In accordance with FRA guidance, Table 4 reflects only the market share ridership and revenue increases that are associated with additional projects improvements in OTP and capacity. The baseline year shown in the table as zero includes current ridership levels.

The market share increase baseline year is 2011. In 2012, the OTP influence adds 22,300 passengers per year with per-year additions continuing but decreasing through 2018. In 2014, the travel-time decreases realized from these projects add 362,600 passengers per year, and in 2015 the projects add 148,600 more passengers per year. The ridership gains reach a peak in 2018 at 566,800 passengers added per year from the combined influences. While there are no additional increases the Corridor base ridership is permanently increased by the benefits of the projects.

Table 4 — Forecast Ridership and Revenue Changes due to Project Influence for the *Pacific Surfliner*

Forecast Ridership and Revenue Changes Due to Project Influence
Pacific Surfliner Corridor - Service Development Plan

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Annual Ridership	**BASELINE**			**FIRST YEAR**				**YEAR 5**					**YEAR 10**
Prior Year Baseline		0	22,300	34,300	402,300	556,000	560,600	564,800	566,800	566,800	566,800	566,800	566,800
Service Changes:													
Travel Time		0	0	362,600	148,600	0	0	0	0	0	0	0	0
On-Time Performance		22,300	12,000	5,400	5,100	4,600	4,200	2,000	0	0	0	0	0
Pricing Actions		0	0	0	0	0	0	0	0	0	0	0	0
Total Project Influence		**22,300**	**34,300**	**402,300**	**556,000**	**560,600**	**564,800**	**566,800**	**566,800**	**566,800**	**566,800**	**566,800**	**566,800**
Annual Ticket Revenue													
Service Changes:													
Prior Year		$0	$442,000	$693,000	$9,149,000	$12,854,000	$13,211,000	$13,567,000	$13,883,000	$14,161,000	$14,444,000	$14,733,000	$15,028,000
Travel Time		$0	$0	$8,167,000	$3,347,000	$0	$0	$0	$0	$0	$0	$0	$0
On-Time Performance		$433,000	$237,000	$110,000	$106,000	$98,000	$90,000	$44,000	$0	$0	$0	$0	$0
2% Growth (Inflation)		$9,000	$14,000	$179,000	$252,000	$259,000	$266,000	$272,000	$278,000	$283,000	$289,000	$295,000	$301,000
Total Project Influence		**$442,000**	**$693,000**	**$9,149,000**	**$12,854,000**	**$13,211,000**	**$13,567,000**	**$13,883,000**	**$14,161,000**	**$14,444,000**	**$14,733,000**	**$15,028,000**	**$15,329,000**

Notes:

Market Growth

2012-2025: based on California Department of Finance growth and population projections

Service Changes

2012-2025: changes in frequency, travel time, and on-time performance as shown above; OTP impacts reflect 6-month delay in market response

Pricing Actions

2012-2025: +2% per year applied to all prices (assume no ridership loss since increase matches inflation rate)

5.2.2 Ticket Revenue Forecasts

Ridership described in the previous section directly affects ticket revenue, along with a 2% increase for ticket prices / inflation per year. In 2012, the OTP influence adds $433,000 per year with per-year additions continuing but decreasing through 2018. In 2014, travel-time decreases realized from these projects add $8,167,000 in revenue per year, while in 2015 the projects add another $3,347,000. The gains reach a peak in 2018 at $13,883,000 added per year (includes ticket cost/inflation increases) from the combined influences. Inflation continues to influence total increases, with $15,329,000 added per year in 2023. While the year to year increases not continue in future years, these increases are forecast to be part of the Corridor's revenues permanently.

5.2.3 Auxiliary Revenue Forecasts

Auxiliary revenue consists of food/beverage service sales and a small amount of package-express service. The Department has found that auxiliary revenue is consistently an additional 7% revenue on top of ticket revenue. The Department expects that percentage to remain the same throughout the project period.

6.0 Operations Modeling

The Pacific Surfliner Corridor Operations Analysis (Operations Analysis), attached as Appendix A, includes all ten projects in the Capacity Enhancement Program application. These projects are referred to in the Operations Analysis and the following summary, as Track 1 and Track 2 projects. The additional 11 projects discussed in the Operations Analysis were either funded locally and are under construction, or will not have an impact on the ultimate operations or the value of the model effort for the purpose of this SDP.

Table 5 lists projects within the SDP endpoints and includes location and status/relevance.

This train simulation modeling was completed on Sept. 28, 2009 and was originally intended to be incorporated into the federal stimulus applications for all Track 2 projects. This train modeling effort covers the entire length of the rail corridor – San Luis Obispo to San Diego; however, the portions from San Luis Obispo to Los Angeles are not discussed below, as none of the Capacity Enhancement Program projects are located north of Los Angeles.

Table 5 — Los Angeles to San Diego

Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Status/Relevance
Triple Track Los Angeles to Fullerton; *San Bernardino Subdivision between CP Vail and CP Buena Park (Source: Hobart to Basta Third Main Track; Track Alignment Schematic, 08-2006)*	Approx. MP 151.0 and 159.0	Included in Service Development Plan
OCTA Metrolink Service Expansion (MSEP) - Fullerton Turnback Facility	MP 165.1 and 166.1	Under Construction. Local Funds.
OCTA Metrolink Service Expansion (MSEP) – Laguna Niguel Turnback Facility	MP 192.4 and 194.1	Under Construction. Local Funds.
Orange County LOSSAN Universal Crossovers and Additional Tracks; *Anaheim Universal Crossover (CP Stadium) and power Union Pacific Railroad (UPRR) industry lead switch.*	MP 170.3	Included in Service Development Plan
Orange County LOSSAN Universal Crossovers and Additional Tracks; *Complete Universal Crossover at CP Lincoln and power UPRR industry lead at 4th Street.*	MP 174.7	Included in Service Development Plan
Orange County LOSSAN Universal Crossovers and Additional Tracks; *Laguna Niguel Universal Crossover and Turnout (CP Galivan)*	MP 192.1	Under Construction. Local Funds.
Orange County LOSSAN Universal Crossovers and Additional Tracks; *Orange Relief Siding*	MP 172.42 (Orange) and MP 4.7 (Olive)	Under Construction. Local Funds.
Laguna Niguel to San Juan Capistrano Double Track	MP 193.9 and MP 196.8	Included in Service Development Plan
Orange County LOSSAN Signal and Wayside Detector Upgrades and including signal Re-spacing; *New CP Alicia and CP Yale*	MP 181.6 and MP 189.3	Included in Service Development Plan
OC - Comm. upgrades incl. fiber/microwave to Stuart Mesa	Orange Subdivision	No significant impact.
Orange County LOSSAN System-wide Track (concrete ties new rail) Upgrades	Orange Subdivision	Rehab project – no significant impact
San Diego LOSSAN Oceanside Station Stub Track - Project 1; *For Metrolink trains.*	MP 226.1 and 226.4	Funded in Track 1 HSIPR
LOSSAN San Diego Los Penasquitos Lagoon Bridge Replacement	MP 246.1, 246.9 and 247.1	Mainly rehab -- no significant impact.
San Diego LOSSAN Sorrento-Miramar Alignment Improvement; *Provides speed improvements*	MP 251 and 252.9	Included in Service Development Plan
San Diego LOSSAN Railroad Crossover Program; *Tecolote and Washington Street Universal Crossovers*	MP 265.3 and 263.5	Funded Track I
Signal and Communications Upgrade to improve safety and approach and departure speeds and capacity at LAUS.	MP 0.0 and MP 0.8	Minimal impact. Project held pending resolution of high-speed rail design plans at LAUS
Irvine Third Main Line Track; *to include new universal crossovers at CP Tinkham, CP El Toro, MP 177.9, and MP 190.3*	MP 177.9 and 190.3	Included in Service Development Plan
Santa Ana to San Juan Capistrano 110 MPH Upgrade	MP 176.1 and 197.0	No significant impact based on expected service levels.
San Diego LOSSAN CP San Onofre to CP Pulgas Double Track; *to include universal crossovers at San Onofre and Pulgas*	MP 212.3 and 218.1	Included in Service Development Plan
San Diego LOSSAN Oceanside Station Stub Track - Project 2; *for Coaster*	MP 226.4 and 227.2	Included in Service Development Plan
San Diego LOSSAN Carlsbad Double Track	MP 229.4 and 231.4	Amtrak Funded.

Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Status/Relevance
San Diego LOSSAN Poinsettia Station Run-Through Track	MP 233.0 and 234.4	Included in Service Development Plan
San Diego LOSSAN CP Cardiff to CP Craven Double Track	MP 239.6 and 241.1	Minimal impact – planned for future calls for funding.
San Diego LOSSAN San Dieguito Bridge Replacement and Double Track / Del Mar Fairgrounds Permanent Seasonal Rail Platform	MP 242.2 and 243.3	Minimal impact. Applied for as an individual project this cycle.
San Diego LOSSAN Sorrento Valley Double Track	MP 247.7 and 249.0	Included in Service Development Plan

The base case pinpoints the locations where the capacity is constrained, and then modeling was conducted to validate the performance improvements once the capital program is implemented. The Operations Analysis supports the need for the Capacity Enhancement Program and validates the anticipated operational benefits including reductions in train travel times, improved on-time performance, speed increases and additional track capacity to operate at a higher frequency for future intercity passenger rail. While these projects improve capacity, the Department doesn't anticipate additional frequencies until additional future state operations funding is secured.

Also, minutes of passenger train delays are documented by Amtrak in its database that compiles train delays by type, frequency and duration of delay. A summary of train delays for the Federal fiscal year 2008-09 show that the on-time performance for Amtrak Pacific Surfliner trains was 83%. The percentage of delays due to train meets and other related factors, such as dispatcher hold times, indicate that lack of track capacity is a serious and frequent cause of passenger train delays in this rail corridor.

Further, the transportation benefits resulting from the proposed capital program will address the goals set forth by both the state, as discussed in the California State Rail Plan (2007-2008 to 2017-2018), and the federal goals established for the HSIPR Program which includes; Safety, Reliability, Jobs and Economic Stimulus, Intermodal Connectivity, Sustainability, Increased Service and Reliability, and Strategic Integration with Statewide Plans.

The Operational Analysis provides a comparative view of identified projects along the corridor, (categorized into three columns discussed in the methodology section), and outlines how individual projects, or combination of projects, can benefit passenger service and performance along the corridor. These infrastructure improvements will enable the region to provide an enhanced service profile meeting the requirements for High Speed Rail set out in the Federal Guidelines. The plans will provide for High Speed Rail operations on the LOSSAN Corridor in three of the federally defined fields:

- Conventional Operation - upgrading existing conventional routes to 79 MPH.
- Emerging High Speed Rail - Providing additional track improvements and deploying safety systems to enable lines speeds up to 110 MPH.
- High Speed Rail Regional - Providing infrastructure improvements that are directly attributable to enabling High Speed train operations by elimination of crossings at grade.
- The analysis was based on observations made on three infrastructure and service scenarios developed for the LOSSAN rail corridor simulation model. The three cases included:
- **Case 1** - **Track 1 on Track 1 (Base Case):** Existing service and 12 Orange County Intra-county trains on the corridor infrastructure assumed for the OCTA Metrolink Service Expansion Program (MSEP) and subsequent HSIPR Track 1 projects for the entire LOSSAN corridor.

- **Case 2** - **Track 2 on Track 1:** Year 2015/16 passenger train service level on Case 1 infrastructure. Service levels under this case include the OCTA Metrolink Phase 3 service enhancements, 2015 service projections for Coaster trains, and 2015/16 service projections for the Pacific Surfliner.
- **Case 3** - **Track 2 on Track 2:** Service levels assumed under Case 2 operating with all Track 2 projects identified by the corridor agencies.

Based on the analysis of these three cases with different service and infrastructure levels, the infrastructure projects identified in this Operations Analysis are sufficient to accommodate the proposed service levels assumed for years 2015/16. The observations and analysis performed show that the infrastructure upgrades, especially south of Los Angeles Union Station would be most effective in improving the on-time performance of all passenger services on the corridor. It can be assumed at this time that given the lack of specific information north of Los Angeles needed for coding into the model, specifically, the signal system, the full effectiveness of the Track 2 projects might not be fully realized for projects north of Los Angeles.

However, the projects that were reviewed as part of the Operations Analysis still prepare the corridor for speed increases and trip time reductions. This iterative series of improvements will enhance conventional passenger rail operations and safety. The completed Track 1 and 2 projects can serve as an effective platform for redefining service along the LOSSAN corridor, consistent with the strategic goals established in the State Rail Plan and providing convenient connections to the statewide high speed rail network. The quality of life in the region will also benefit from an enhanced intercity transportation system that can provide more travel options for commuters and leisure travelers alike.

6.1.1 Model Applications

The Berkeley Simulation Software Rail Traffic Controller (RTC) model (Model) was selected as the platform on which to conduct the operations analysis for the Operations Analysis. The Model was selected because it provides a variety of analytical and reporting capabilities encompassing the range of information required for this analysis and can realistically simulate higher-speed train operations in a mixed-use operational environment (intercity, commuter and freight services). The Model can also accurately simulate passenger and freight operations based on train set performance characteristics along a specified corridor, including different geometric parameters and infrastructure configurations. The advantage of the Model is that it is designed as a flexible tool that can be further modified, refined and upgraded as needed to evaluate different operational and infrastructure assumptions and configurations. In addition, RTC is a federally designated modeling tool that the FRA recommends grantees utilize for the operations analysis of any rail related funding application.

6.1.2 Equipment Consists

Operational needs and seat capacity have been key factors in the selection of rail car types and equipment configuration for this corridor. Bi-level intercity rail cars have both the comfort (seat size, leg room, etc.) plus the capacity to allow fewer coaches in a trainset than would be required for a single level rail car. Station dwell times are important on this very busy route and the door openings permit expedited loading and unloading of passengers. The typical Pacific Surfliner trainset is comprised of a locomotive, a cab controlled car, a food service car and at least three coaches (more are added for busier trains).

For the purposes of the Model, train characteristics were based on the existing consists and train set equipment, including:

- For passenger services, trains powered by General Motors F59PHI and Motive Power MP36 locomotives capable of a maximum operating speed near 110 MPH.
- For freight services, trains by a range of motive power, but generally by General Electric Dash 9- 44CW and General Motors GP-38 locomotives capable of maximum operating speeds near 70 MPH. For the purposes of simulating the cases described above, the

train set performance characteristics (i.e. tractive effort curve, braking effort curve, weight, etc.) are based on represented consists previously used in simulations of the Los Angeles to San Diego rail corridor for each passenger and freight train classification.

These configurations are conservative assumptions that are representative of typical consists that have operated or are planned to be operated along the corridor. Specific assumptions are elaborated in more detail under the sections describing each case.

6.2 Base Case - Track 1 on Track 1

Case 1 is considered the base case scenario, and is necessary for validating the conditions before the Track 2 improvements are implemented and is the network from which all subsequent cases are to be "based". To develop this, the Track 1 Project Case network used for the "Preliminary LOSSAN Economic Stimulus Operations Analysis" (conducted in June 2009), is utilized as the template. Modifications were made to this network to reflect the infrastructure assumptions submitted in the Track 1 packages to the Federal Railroad Administration (FRA) and the operational timetables are consistent with the improvement plans developed by the corridor agencies.

6.2.1 Infrastructure Assumptions

All Track 1 infrastructures on the Base Case were carefully reviewed against the final Track 1 project list prepared by the Department and modifications were made where necessary.

6.2.2 Operational Assumptions

There is a project duration requirement of the Track 1 funding application in which all projects need to be completed within 2 years of the grant award, therefore, the projected service plan for the year 2011/12 is used as the operational baseline for this case. Service assumptions have been determined as follows:

Table 6 — Track 1 Service Levels

Service/Operator	No. of One-Way Trips / Day	
	2008/2009	2011/2012
Amtrak Southwest Chief	2	2
Amtrak Coast Starlight	2	2
Amtrak Pacific Surfliner	-	-
San Luis Obispo – Goleta	4	4
Goleta – Los Angeles	10	10
Los Angeles – San Diego	22	22
Metrolink Ventura Line	20	20
Metrolink Burbank/Bob Hope Service	10	10
Metrolink OC Line	19	19
Metrolink/OCTA Intra-County Service	-	12
Metrolink IEOC Line	16	16
Metrolink 91-Line	9	9
Coast Express Rail (Coaster)	22	22

Sources: NCTD, Metrolink, OCTA, Amtrak

In addition to these passenger rail services, freight trains were added based on actual observed BNSF train movements and operating conditions along the LOSSAN corridor in 2007.

6.2.3 Modifications to Existing Service

In order to accommodate the Metrolink Orange County Intra-County service, the following modifications were made to selected trains along LOSSAN South corridor.

Table 7 — Metrolink Orange County Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
601	From Oceanside	4:43 AM	4:48 AM
603	From Oceanside	5:20 AM	5:18 AM
605	From Oceanside	5:50 AM	5:48 AM
689*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	5:10 PM
685	From Laguna Niguel/Mission Viejo	7:55 AM	8:00 AM
682	From Los Angeles Union	6:45 AM	6:40 AM
684	From Los Angeles Union	2:25 PM	2:20 PM
602	From Los Angeles Union	3:20 PM	3:00 PM
686	From Los Angeles Union	3:50 PM	3:30 PM
604	From Los Angeles Union	4:30 PM	4:20 PM

Train(s) extended from Irvine to Laguna Niguel

Table 8 — Metrolink IEOC Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
802**	From Laguna Niguel/Mission Viejo	(Originate from San Juan Capistrano)	1:35 PM
804	From Laguna Niguel/Mission Viejo	4:00 PM	3:50 PM
806*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	4:50 PM
808	Between Oceanside and San Juan Capistrano	-	3 minutes earlier
810	From Laguna Niguel/Mission Viejo	6:30 PM	6:20 PM
805*	From San Bernardino	5:22 AM	5:11 AM
807	From San Bernardino	5:57 AM	5:52 AM
811**	To Laguna Niguel/Mission Viejo	(Terminate at San Juan Capistrano)	(Terminate at Laguna Niguel/Mission Viejo)
813	From Riverside-Downtown	3:27 PM	3:12 PM

** Train(s) extended from Irvine to Laguna Niguel/Mission Viejo*
*** Train(s) shortened from San Juan Capistrano to Laguna Niguel/Mission Viejo*

Table 9 — Metrolink 91-Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
701	From Riverside-Downtown	5:29 AM	5:00 PM
703	From Riverside-Downtown	6:29 AM	6:24 AM
707	From Riverside-Downtown	5:49 PM	6:00 PM
702	From Los Angeles Union	6:25 AM	6:20 AM
704	From Los Angeles Union	12:45 PM	12:35 PM
706	From Los Angeles Union	4:20 PM	4:30 PM
708	From Los Angeles Union	5:25 PM	5:30 PM

Table 10 — Amtrak Pacific Surfliner Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
565	Between Irvine and Los Angeles Union	-	2 to 5 minutes later
567	Between Irvine and Los Angeles Union	-	2 to 5 minutes later
583	Between Oceanside and San Juan Capistrano	-	1 to 3 minutes
785	Between Oceanside and San Juan Capistrano	-	1 to 3 minutes
589	From San Diego	5:55 PM	5:50 PM
562	From Los Angeles Union	6:05 AM	6:10 AM
564	From Los Angeles Union	7:20 AM	7:10 AM
582	From Los Angeles Union	4:10 PM	4:20 PM
592	From Los Angeles Union	8:30 PM	8:20 PM

6.2.4 Model Output Results

Once the network was calibrated, an analysis was performed to identify conflict locations that presented impacts to schedule reliability and on-time performance. The observations made during the analysis for the Base Case are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- The existing operation plans are well designed with consideration of siding locations and time penalty for the manual control switches at sidings, only a few minor conflicts were observed. Due to the installation of new centralized traffic control (CTC) with powered switches at former manual sidings and the speed upgrades of the track infrastructure, delays caused by meets and passes are minimized. This allows for trip time reduction and creates additional time buffer for passenger trains operated in this area.

Santa Barbara to Los Angeles

- Like the condition along the San Luis Obispo to Santa Barbara segment, the existing timetables between Santa Barbara and Los Angeles are developed based on the availability and location of the sidings so that delays associated with meets and passes are minimized along the primarily single track corridor. The scheduled pad provided in each of the timetables allows any delays caused by meets and passes to typically be absorbed at the end terminal.

- Although the significance of the delays is minor thanks to these practices, there are a few locations in Ventura County where numerous trains were delayed while holding for opposing traffic. The most significant bottleneck was observed near the Simi Valley Station, where the station is located in a single-track section between two sidings. Here, several trains were held at control point (CP) Santa Susana or CP Strathern to "wait their turn" serving the single track station.
- The single track segment between CP Raymer and CP De Soto (Bernsen) and the single platform at the Van Nuys Station were observed to be a critical bottleneck in the corridor north of Los Angeles Union Station. Since the Van Nuys station platform is available only on Main Track 2, outbound trains are held at CP Woodman to allow inbound trains to serve the station and pass.

Los Angeles to San Diego

- Los Angeles Union Station remains a significant bottleneck, where all Amtrak and Metrolink trains (except the IEOC Line) operate in and out of the 10-track station through five approach tracks. Most conflicts were observed to be caused by deadhead movements to and from the Central Maintenance Facility. These deadhead movements often conflicted with inbound trains during the morning peak period and outbound trains during the afternoon peak period.
- The completion of triple-track project between Redondo Junction and Fullerton Junction on the BNSF San Bernardino Subdivision eliminated most delays for passenger trains. However, the location of new crossovers lowers the operational flexibility because it does not reflect the entrance points of freight yards. For instance, there are only two ways to traverse trains between Hobart Yard and La Mirada Yard and only one way between Pico Rivera Yard and La Mirada Yard in the new configuration. This may cause additional rail traffic congestion and delays when freight traffic increases.
- With the installation of additional crossovers in Orange County, conflicts associated with freight train movements during the mid-day periods were reduced. The construction of a second track section along the Olive subdivision eliminated delays associated with outbound IEOC trains holding at the Orange Station for an inbound IEOC train to clear the Olive subdivision. This improvement reduced overall delays along the Orange subdivision. The extension of double track south of Laguna Niguel, reduced the delays associated with southbound trains holding for northbound trains to clear the single track segments. This double track extension provided an estimated three minutes per passenger seat mile of reduced delay. South of this second track extension, trains continue to be held at CP Capistrano and CP Serra, located at each end of the Serra siding. This siding is the only two track segment of corridor between the end of the double track extension and CP Songs (a distance of approximately 13 miles), creating a capacity constraint on the number of trains that can serve the south Orange County area, and impacting the on-time performance and reliability. However, the delay is typically absorbed by schedule pad and does not cause significant delays to be carried over to the BNSF territory north of Fullerton Junction.
- Relocation of the storage track at Laguna Niguel/Mission Viejo Station due to the southward double track extension appeared to have minimal impacts to overall train operation, and did not impact the ability for the Intra-County trains to turn within their previously determined time slot.
- The signal re-spacing reduces traffic congestion and "bunching" during peak periods by allowing trains to operate on shorter headways while still maintaining a clear signal aspect.
- The Oceanside station "stub" track proposed for Metrolink trains improves the overall platform capacity at the Oceanside station. This capacity increase reduced the overall impact of delays by allowing Amtrak, Coaster and Metrolink to serve the station simultaneously. In the future, this capacity increase can also allow for Metrolink and

Coaster timetables to be more integrated, allowing transfers from one service to the other.

- COASTER currently stores train sets on the second track between CP Westbrook and CP Eastbrook to free up platform space at Oceanside while turning the train sets (e.g. SDNR 645 and 654). This method of operation presents a capacity constraint by effectively single-tracking the corridor between CP Shell and CP Puller. This constraint primarily impacts trains that were already delayed and operating outside of their designated time slots. These trains therefore were held and obtained an additional time penalty, which created delays for additional trains when their scheduled meet times were missed.
- An additional location where delays were observed was the single-track sections between the Solana Beach Station and CP Miramar. While the existing timetable is designed to minimize the delays associated with meets, again the constraints were observed to primarily impact trains that were already delayed and operating outside of their designated time slots. These trains forced trains that were operating on-time to take a time penalty while holding for the delayed train, therefore delaying the opposing train and impacting additional scheduled meet times.

6.3 Case 2 - Track 2 on Track 1

Case 2 involves incorporating additional passenger train trips proposed by Metrolink, Amtrak and COASTER while the infrastructure is kept at the Base Case (Track 1) level. This case is intended to be the control sample of this operations analysis. A comparison of this case with Case 3 was performed in order to clarify the benefits and effectiveness of the Track 2 projects. This provides an opportunity to observe and find conflicts and operational chokepoints and determine if these locations are eliminated or reduced by the Track 2 projects.

6.3.1 Infrastructure Assumptions

The infrastructure assumptions for Case 2 are the same as presented in Case 1 – Track 1 on Track 1.

6.3.2 Operational Assumptions

Due to the requirements in the Track 2 funding application, the passenger train services on the corridor for this case are run according to the levels provided by the corridor agencies for year 2015/2016. Based on the long-range plans released or underway by the operators and the corridor agencies, service levels for this case are determined as follows:

Table 11 – Track 2 Service Levels

Service/Operator	No. of One-Way Trips / Day		
	Existing 2008/2009	Track 1 2011/2012	Track 2 2015/2016
Amtrak Southwest Chief	2	2	2
Amtrak Coast Starlight	2	2	2
Amtrak Pacific Surfliner	-	-	-
San Luis Obispo – Goleta	4	4	6
Goleta – Los Angeles	10	10	12
Los Angeles – San Diego	22	22	22 + 6 Express
Metrolink Ventura Line	20	20	20
Metrolink Burbank/Bob Hope Service	10	10	10
Metrolink OC Line	19	19	19
Metrolink/OCTA Intra-County Service	-	12	18
Metrolink IEOC Line	16	16	26
Metrolink 91-Line	9	9	9
Coast Express Rail (Coaster)	22	22	32

Sources: NCTD, Metrolink, OCTA, Department of Transportation, Rail Division

For Amtrak, the travel times of the Pacific Surfliner trains have a Year 2020 travel time goal envisioned by the Department. The travel time goals for each segment and each service type are summarized below:

- Between San Luis Obispo and Goleta in 2 hours and 10 minutes.
- Between Goleta and Los Angeles Union Station in 2 hours.
- Between Los Angeles Union Station and San Diego in 2 hours and 30 minutes and 1 hour and 55 minutes, by limited stop (8 stops) and Express (4 stops), respectively. While these projects improve capacity, the Department doesn't anticipate additional frequencies until additional future state operations funding is secured.

6.3.3 Modifications to Existing Service

In order to accommodate the additional services proposed for the 2015/16 timeframe, schedule modification were made to selected trains along LOSSAN corridor from the Track 1 timetable.

Table 12 – Metrolink Orange County Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
601	From Oceanside	4:43 AM	4:48 AM	-
603	From Oceanside	5:20 AM	5:18 AM	-
605	From Oceanside	5:50 AM	5:48 AM	-
689*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	5:10 PM	-
685	From Laguna Niguel/Mission Viejo	7:55 AM	8:00 AM	-
OCN05	From Laguna Niguel/Mission Viejo	9:15 AM	9:20 AM	5 minutes later
OCN07	From Laguna Niguel/Mission Viejo	12:00 PM	11:35 AM	25 minutes earlier
682	From Los Angeles Union	6:45 AM	6:40 AM	-
684	From Los Angeles Union	2:25 PM	2:20 PM	-
602	From Los Angeles Union	3:20 PM	3:00 PM	-
686	From Los Angeles Union	3:50 PM	3:30 PM	-
604	From Los Angeles Union	4:30 PM	4:20 PM	-
688	From Los Angeles Union	4:50 PM	4:55 PM	5 minutes later
606	From Los Angeles Union	5:40 PM	5:55 PM	15 minutes later

Italics: Trains added in Track 1 Service Plan
* Train(s) extended from Irvine to Laguna Niguel

Table 13 Metrolink IEOC Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
802**	From Laguna Niguel/Mission Viejo	(Originate from San Juan Capistrano)	1:35 PM	-
804	From Laguna Niguel/Mission Viejo	4:00 PM	3:50 PM	-
806*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	4:50 PM	-
808	Between Oceanside and San Juan Capistrano	-	3 minutes earlier	-
810	From Laguna Niguel/Mission Viejo	6:30 PM	-	10 minutes later
803	Arrival At Oceanside	7:15 AM	7:05 AM	10 minutes earlier
805*	From San Bernardino	5:22 AM	5:11 AM	-
807	From San Bernardino	5:57 AM	6:02 AM	10 minutes later
809	From Riverside-Downtown	7:26 AM	7:21 AM	5 minutes earlier
811**	To Laguna Niguel/Mission Viejo	(Terminate at San Juan Capistrano)	(Terminate at Laguna Niguel/Mission Viejo)	-
813	From Riverside-Downtown	3:27 PM	3:12 PM	-
850	Between Oceanside and Riverside-Downtown	-	(Discontinued)	-
851	Between Riverside-Downtown and Oceanside	-	(Discontinued)	-

** Train(s) extended from Irvine to Laguna Niguel/Mission Viejo*
*** Train(s) shortened from San Juan Capistrano to Laguna Niguel/Mission Viejo*

Table 14– Metrolink 91-Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
701	From Riverside-Downtown	5:29 AM	5:00 PM	-
703	From Riverside-Downtown	6:29 AM	6:24 AM	-
707	From Riverside-Downtown	5:49 PM	6:00 PM	-
702	From Los Angeles Union	6:25 AM	6:30 AM	10 minutes later
704	From Los Angeles Union	12:45 PM	12:35 PM	-
706	From Los Angeles Union	4:20 PM	4:30 PM	-
708	From Los Angeles Union	5:25 PM	5:30 PM	-

Table 15 – Amtrak Pacific Surfliner Service Modifications (North of Los Angeles)

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time
785*	Arrival at San Luis Obispo	(Terminate at Goleta)	12:38 AM
589**	Arrival at Goleta	(Terminate at LAUS)	12:15 AM
784*	From San Luis Obispo	(Originate from Goleta)	11:25 AM
578**	From Goleta	(Originate from LAUS)	10:20 AM
704	From Los Angeles Union	12:45 PM	12:35 PM
706	From Los Angeles Union	4:20 PM	4:30 PM
708	From Los Angeles Union	5:25 PM	5:30 PM

** Train(s) extended from Goleta to San Luis Obispo*
*** Train(s) extended from Los Angeles Union Station to Goleta*

Table 16 – Amtrak Pacific Surfliner Service Modifications (South of Los Angeles)

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
565	Between San Juan Capistrano and Los Angeles Union	-	(Same as original)	5 minutes earlier
567	From San Diego	8:10 AM	8:25 AM	15 minutes later
589	From San Diego	5:55 PM	5:55 PM	5 minutes later
562	From Los Angeles Union	6:05 AM	6:25 AM	15 minutes later
564	From Los Angeles Union	7:20 AM	7:10 AM	-
566	Between San Clemente Pier and Old Town	-	1 minute later	1 minute later
582	From Los Angeles Union	4:10 PM	4:05 PM	-

Table 17 – Coaster Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time
631	From San Diego	6:31 AM	6:21 AM
635	From San Diego	7:45 AM	7:15 AM
661	From San Diego	5:27 PM	5:32 PM
663	From San Diego	6:16 PM	6:05 PM
630	From Oceanside	5:18 AM	5:00 AM
634	From Oceanside	6:03 AM	6:20 AM
638	From Oceanside	7:15 AM	7:21 AM
640	From Oceanside	7:42 AM	7:39 AM
656	From Oceanside	3:29 PM	4:10 PM
662	From Los Angeles Union	4:30 PM	4:20 PM
664	Between Oceanside and San Diego	(Fridays only)	(Run daily as SDNR-S4)
671	Between San Diego and Oceanside	(Fridays Only)	(Run daily as SDNR-N4)

6.3.4 Model Output Results

Once the network was calibrated, an analysis was performed to identify conflict locations that presented impacts to schedule reliability and on-time performance. The following observations were made during this analysis for the Case 2 scenario and are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- Additional service to Goleta and San Luis Obispo requires the use of sidings which would not be powered by the Track 1 funding, specifically the Waldorf Siding, in order to accommodate meets and passes. As a result, trains using the Waldorf Siding with manual switches are delayed due to time penalties incurred by having to throw the switches.
- The speed increases at five locations in this segment significantly shorten the travel time north of Santa Barbara. As a result, all trains operated in this segment, except southbound Coast Starlight (#14), arrive at stations from 15 to 60 minutes earlier than they are currently scheduled.
- As a result of the Track 1 projects in this segment, run-times between San Luis Obispo and Goleta (based on the dispatched result with minimum of 1 minute dwell time at intermediate stations) was reduced to between 2 hours and 7 minutes and 2 hours and 20 minutes, depending on the time of day. The trip with the shortest run-time, since it was a late evening run, had no meets or passes occur in this segment. This shortest run-time is faster then the current average travel time of 2 hours of 15 minutes and slightly faster than the target travel time of 2 hours and 10 minutes, set by the Department.

Santa Barbara to Los Angeles

- Based on the run-time results in the model output, trains travel between Goleta and Los Angeles Union Station between 2 hours and 30 minutes and 2 hours and 40 minutes with one-minute minimum station dwell time at all intermediate stations, except Santa Barbara where trains are scheduled to stop for 3 minutes. This is significantly faster than the existing scheduled run-time between 2 hours and 50 minutes and 3 hours and 10 minutes, but it does not yet meet the target trip time of 2 hours, set by Department of Transportation, Division of Rail.

- Absence of adequate passing sidings or double-track section in western Ventura County, specifically a section between Ventura Station and Camarillo Station, is a source of conflicts and delay. Since Leesdale Siding is not controlled by CTC and there is only one platform at the Oxnard Station, only one location is available for meets and passes near the Ventura Station in this 30-mile segment.
- As with the Track 1 observations, the single-track section in Simi Valley between CP Stathearn and CP Santa Susana is the most critical bottleneck in Ventura County. Although delays on northbound trains tend to be absorbed by scheduled time buffer, several trains were held at CP Santa Susana or CP Strathern to "wait their turn" serving the single track station.
- Single-track section between CP De Soto (Bernsen) and CP Woodman is a bottle neck with increased Amtrak service. There are numerous occasions throughout the day when trains get held at CP De Soto (Bersen), CP Raymer, CP Elliker and CP Woodman to meet and pass other trains from the opposite direction. The single-track operation at Van Nuys Station also creates conflicts and delays due to this competition over track availability.

Los Angeles to San Diego

- The run-times of the Surfliner express trains as presented in the model output showed trip times between 2 hours and 25 minutes and 2 hours and 30 minutes, while the local Surfliner trains operated between 2 hours and 35 minutes and 2 hours and 46 minutes. The express times present a faster travel time of approximately 15 to 20 minutes over the current Pacific Surfliner travel times, but do not meet the target trip time of less than 2 hours, set by the Department.
- Southbound additional timeslots during the evening peak period are hardly available, especially for the new Surfliner Express trains. This is because of increased Metrolink services, which compete for timeslots on the San Bernardino and Orange Subdivisions. As a result, the express trains were slotted within 5 to 10 minutes ahead of or behind departing Metrolink or local Amtrak services out of Los Angeles. Those express trains departing after a Metrolink train typically overtook that train in Norwalk or Buena Park. At least one of the express trains was also required to overtake a Coaster train in San Diego County in order to maintain on-time performance.
- Along segments of the Orange Subdivision, the Surfliner Express trains operate under limited speed signal indication to maintain the headway and avoid overtakes in Orange County, where the proposed train frequency prevents the ability to overtake without impacting opposing movements.
- Congestion in the single-track section between San Juan Capistrano and CP Songs significantly worsens in this Case, especially during the peak period, because of the Surfliner Express. Several trains are held at each ends of the double-track section in order to meet opposing trains.
- Increased Coaster train service and the Surfliner Express trains during peak periods worsen the on-time performance in San Diego mainly due to the lack of adequate passing siding lengths in San Diego County. The most critical bottlenecks appear near the Encinitas Station, where the station is located in a single-track section between two short double-track sections, and a section between Solana Beach and Sorrento Valley Stations, a five-mile single-track section near Del Mar. Delays caused by the capacity constraints at these locations trigger cascades of delays in sections north of Oceanside since the schedules are dependent on trains hitting their "slot" when coming into double-track operations in Orange County due to the increased train frequencies on Metrolink north of Laguna Niguel.
- CP Songs is still observed as the most critical chokepoint in northern San Diego County. Since there is no passing siding between CP Songs and CP Serra, located 8.5 miles apart, trains on both directions tend to get held at the end of double-track sections. Most of the delays caused in this area are delays which increase exponentially

or "snowballed" delays, caused by missed meets and other delays occurred in either Southern Orange County or other parts in San Diego County. Similar conflicts are observed between CP San Onofre and CP Pulgas, a 6-mile long single track segment.

- With the increase in COASTER and Amtrak operations, the single track segments across the Santa Margarita and San Luis Rey Rivers impact peak operations and result in conflicts between revenue and deadhead movements, similar (though less severe) to the impacts at Los Angeles Union Station.
- With additional COASTER service, capacity of the daytime layover tracks in Downtown San Diego will exceed the capacity. While three train sets can be stored in the existing configuration, four train sets are needed to provide 5 traditional peak trips during the evening peak period.

Figure 5 — Stringline Case 2 from Los Angeles to San Diego AM

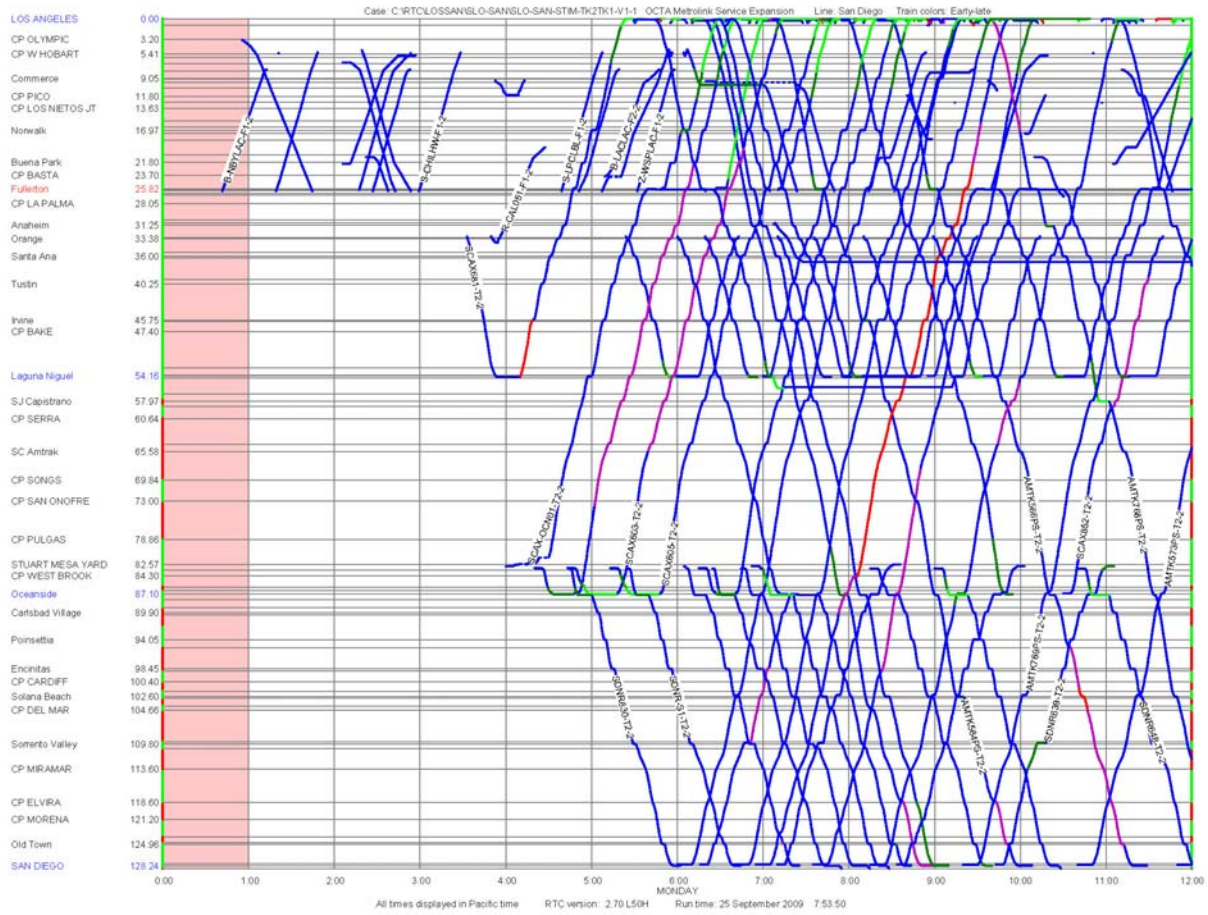
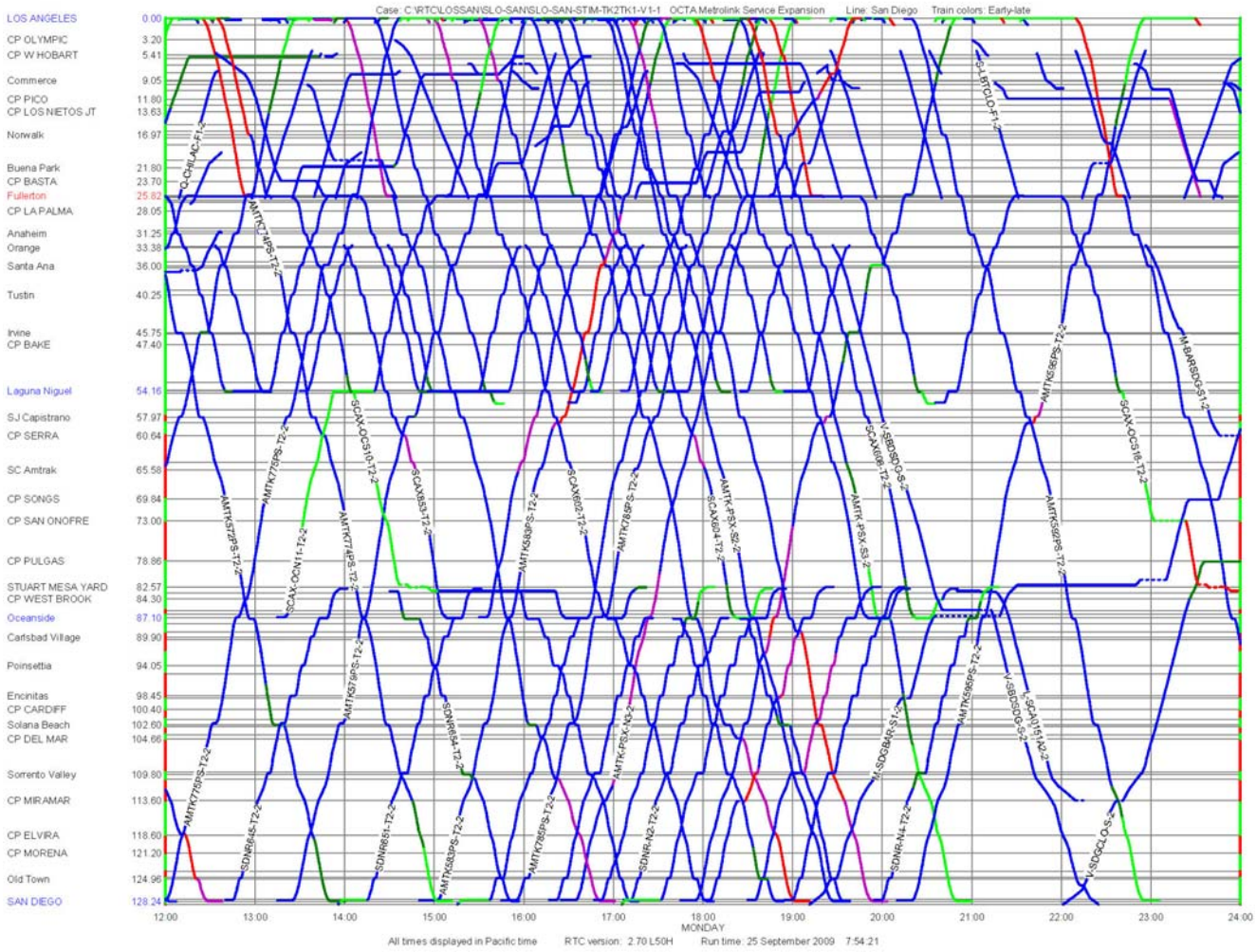


Figure 6 — Stringline Case 2 from Los Angeles to San Diego PM



6.4 Case 3 - Track 2 ON Track 2

Case 3 focused on effects and benefits of improved infrastructure funded through the HSIPR Track 2 funding. By comparing and analyzing the dispatched results between Case 2 and Case 3, the overall strategic impact of the infrastructure improvements can be assessed and quantified.

6.4.1 Infrastructure Assumptions

All Track 2 infrastructure improvements in this Case were carefully reviewed against the final Track 2 project list prepared by the Department of Transportation, Division of Rail and modifications and assumptions

6.4.2 Operational Assumptions

Service levels are the same as what was assumed under Case 2 – Track 2 on Track 1. These assumptions reflect information provided by corridor agencies for year 2015/2016.

6.4.3 Model Output Results

As with Case 2, once the network was updated with the Track 2 projects and the model was calibrated, the analysis was conducted to determine how may of the conflicts observed in Case

2 were resolved by constructing the Track 2 projects, and where additional conflicts still remain. The observations made during this analysis are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- Since there were no specific Track 2 projects that could be quantified to be incorporated into the model, no added track capacity was simulated in this segment and the overall operational condition was not changed from Case 2.

Santa Barbara to Los Angeles

- With limited Track 2 projects coded into the model for this analysis, the run-time results in the model output for trains between Goleta and LAUS are the same as Case 1 and 2, with a travel time between 2 hours and 30 minutes and 2 hours and 40 minutes with one-minute minimum station dwell time at all intermediate stations. This is significantly faster than the existing scheduled run-time between 2 hours and 50 minutes and 3 hours and 10 minutes, but it does not yet meet the target trip time of 2 hours, set by the Department of Transportation, Division of Rail.
- Like the section north of Santa Barbara, there are no observed operational improvements from the Case 2 since there were no Track 2 projects that could be quantified in order to be incorporated into the model.

Los Angeles to San Diego

- Los Angeles Union Station becomes a critical bottleneck during peak periods because of the earlier arrival of trains due to the infrastructure improvements south of Los Angeles. The lack of alternative routes within the approach tracks is the major cause. While improvements to the speeds and approach tracks to LAUS are identified by Metrolink, specific improvements were not available at the time to be coded into the model, so these improvements could not be tested as part of this analysis. Speed improvements were assumed to be increased 5 MPH over existing. However, since specific improvements could not be incorporated into the model, there are several trains, particularly during the peak period, that were observed as delayed from being held on the approaches to the station until the tracks were cleared.
- The speed increases from 90 MPH to 110 MPH in Central Orange County between Tustin and Laguna Hills have a marginal benefit operationally, especially on southbound trains where maximum speed is not even reached due to the uphill grade between Santa Ana and Irvine stations. Though the increased speed creates additional pad time, just a few northbound Amtrak trains which do not stop at Laguna Niguel/Mission Viejo or Tustin stations can actually reach the new MAS of 110 MPH in the segment after departing Irvine, due to the downhill grade to Santa Ana.
- The new triple-track section between Tustin and Mission Viejo does provide additional track capacity, but will be challenging to utilize as an overtake location because of the existing and modified service plan and infrastructure of the surrounding area. The signal block layout does not allow two trains running in close proximity adequate time to overtake each other. This is because the existing and projected infrastructure does not allow trains to run closer than 5-minute headways and all trains stop at the Irvine Station. Due to these limitations, faster trains cannot shorten the headway to complete the overtake before reaching to the end of the triple-track section. However, having infrastructure in this segment would be beneficial assuming a new service plan is developed that takes into account the changes in the operations provided by express versus local service and the ability for Metrolink and Coaster trains to now allow transfers as a result of the Oceanside stub tracks.
- Based on the model output, the travel times for the Pacific Surfliner (both express and local) do show measurable improvement of approximately 10 minutes for local trains and 20 to 25 minutes for express trains, over existing scheduled times. However, due to remaining capacity constraints and limited locations for overtakes, this improvement in

travel time still falls short of the ultimate goal set by the Department of Transportation, Division of Rail of less than 2 hours between Los Angeles and San Diego.

- The new stub track at Oceanside Station for Coaster trains will have an operational benefit that allows two trains to meet and pass at Oceanside while a Coaster train turns. This also helps reduce the traffic volume and increase the operational flexibility in the segment between Oceanside Station and Stuart Mesa Yard by reducing the deadhead movements occurred by inadequate turnback capacity at the Oceanside Station.
- The congestion in the segment between the Orange/San Diego County Line and the Oceanside Station is eased by the elimination of single-track between CP San Onofre and CP Pulgas. However, the remaining single-track section between CP Eastbrook and CP Shell remains a bottleneck.
- A new run-through track at Carlsbad Poinsettia Station allows meets and overtakes at the same time. The overall benefits are realized when Surfliner Express trips are able to overtake Coaster commuter trains at this location, therefore maintaining their speed and on-time performance.

Figure 7 — Stringline Case 3 Los Angeles to San Diego AM

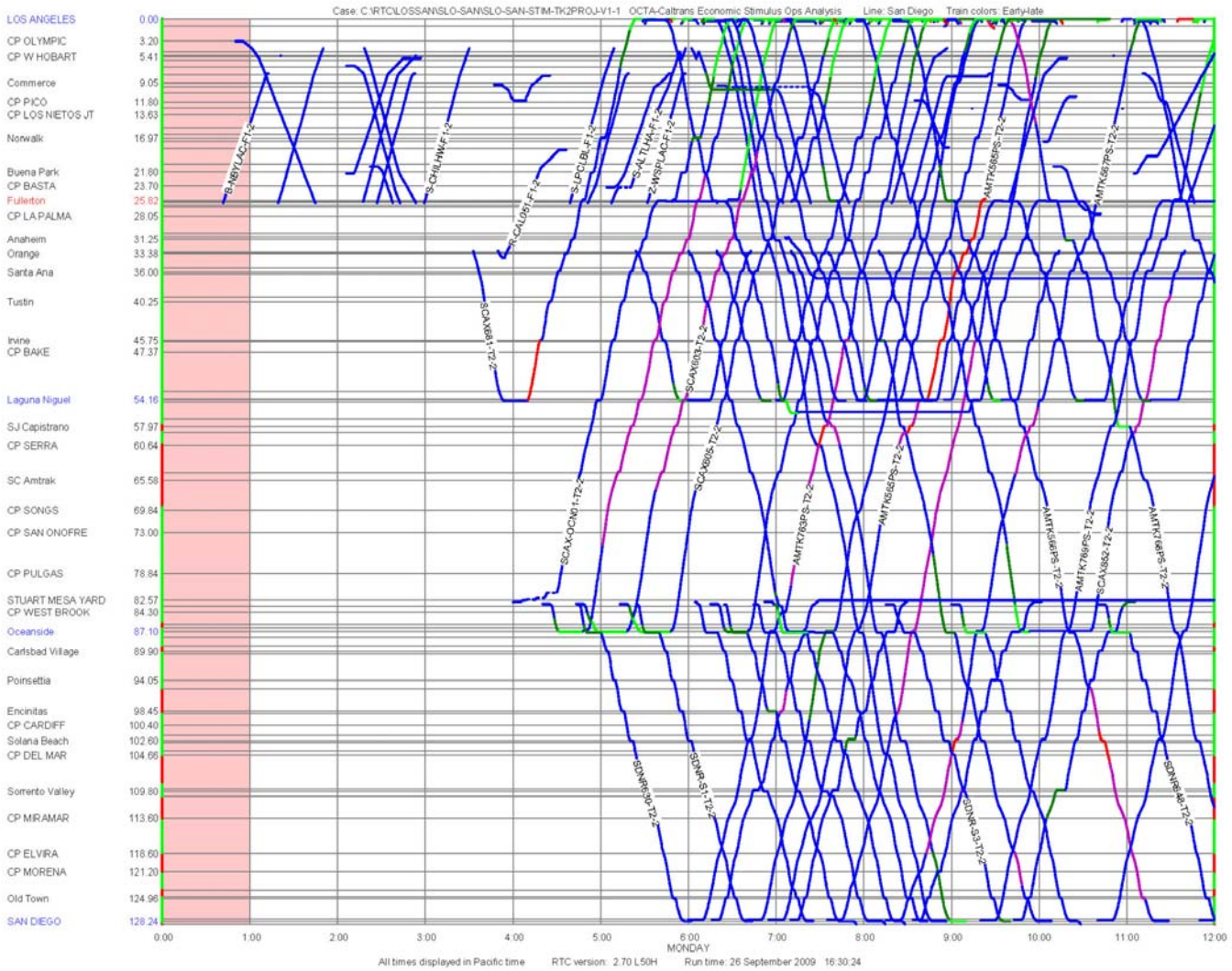
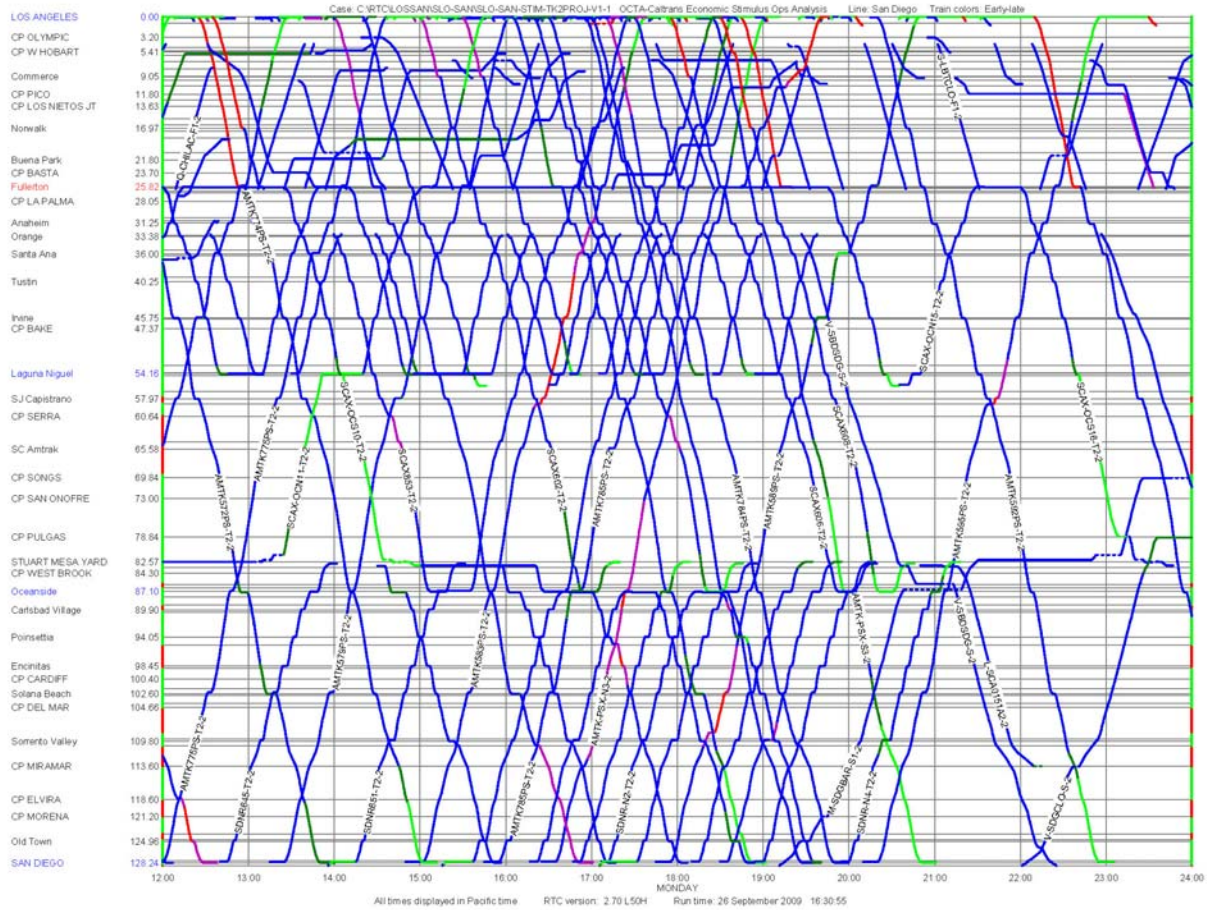


Figure 8 — Stringline Case 3 Los Angeles to San Diego PM



6.5 Conclusion

Based on the analysis of these three different cases with different service and infrastructure levels, the infrastructure projects identified in this SDP as Track 2 are sufficient to facilitate the additional needs in the corridor as outlined in Section 1B, pPurpose and Need. The observations and analysis performed show that the infrastructure upgrades, especially ones in segment south of Los Angeles Union Station would be most effective in improving the on-time performance of all passenger services on the corridor. It can be assumed at this time however that given the lack of specific information north of LAUS needed for coding into the model, the full effectiveness of the Track 2 projects north of Los Angeles might not be fully realized. However, the projects identified in this analysis do prepare the corridor for speed increases and trip time reductions. This iterative series of improvements will enhance conventional passenger rail operations and safety. The completed Track 1 and 2 projects can serve as an effective platform for redefining service along the LOSSAN corridor, consistent with the strategic goals established in the State Rail Plan and providing convenient connections to the Statewide High Speed Rail network. The quality of life in the region will also benefit from an enhancement intercity transportation system that can provide more travel options for commuters and leisure travelers alike.

Once completed, the projects identified in this report will be the culmination of a fully realized regional rail transportation system that would effectively link improved conventional and emerging high-speed rail operations to the California High Speed Train system thereby creating an integrated statewide rail network.

The multi-billion dollar investment into the Southern California regional rail infrastructure will be the basis for rail to compete effectively and decisively with both highway and air transportation modalities. The resulting benefits will satisfy the goals set out by both the Federal and State Rail Plans:

- Safety
- Reliability
- Jobs and Economic Stimulus
- Intermodal Connectivity
- Sustainability
- Increased Service and Reliability
- Strategic Integration with Statewide Plans

6.5.1 Future Recommendations

While the Track 1 and 2 infrastructure configurations identified in Operations Analysis were observed as being able to support the proposed year 2015/16 service levels, daily railroad operations are extremely fluid and the simulations indicate that additional infrastructure projects are needed to further optimize operations along the entire LOSSAN corridor in order to establish a robust operation capable of quickly recovering from unplanned conflicts, delays or incidents. These recommendations are broken down by intercity service segments on the corridor and listed below:

San Luis Obispo to Santa Barbara

- Additional siding rehabilitation projects, possibly Waldorf Siding.

Santa Barbara to Los Angeles

- Second platform at Oxnard Station (on siding track).
- Extension of Santa Susana Siding from CP Santa Susana to Simi Valley Station with the second platform at the station.
- Extension of Camarillo Siding to Leesdale Siding and upgrade of Leesdale to CTC.
- Elimination of single-track section between CP Raymer and CP De Soto (Bernsen).
- Second platform (on Main Track 1) at Van Nuys Station.

Los Angeles to San Diego

- Additional train layup capacity in Downtown San Diego to accommodate increased peak-period Coaster service.
- Significant reduction of the single-track section between CP Serra and CP Songs.
- Sorrento to Miramar Double Track Project Phase II to eliminate the single-track section between Sorrento Siding and CP Miramar while realigning the track to eliminate steep curves and grades.
- Signal re-spacing near overtake locations, namely in segments between Fullerton and Red Hill Avenue in Tustin, near Poinsettia Station siding, and near Solana Beach Station to allow shorter headway.
- Signal re-spacing between Los Angeles Union Station and Redondo Junction to allow train departure and arrival in shorter headway.

7.0 Station and Access Analysis

7.1 Station Location Analysis

The Service Development Plan does not propose to add new stations or new lines; therefore no analysis of station and access is necessary.

7.2 Station Operations

Service frequencies are not being proposed in the SDP; therefore the current station configuration is adequate to meet projected ridership increases.

7.3 Intermodal Connectivity

Of the 26 intercity rail stations on the PS Corridor, the majority (18) are jointly served by light rail, heavy rail (subway or commuter trains) and transit buses, Additionally, many offer connections to other cities, regions and intercity rail routes via the state-supported Amtrak feeder bus system that connects virtually the entire state. More specifically, more than 175 communities are served by this intercity bus system that provides access to the intercity passenger rail system even for remote regions far removed from the closest train station.

7.4 Station Access

Service frequencies are not being proposed in the SDP; therefore the current station access is adequate to meet projected ridership increases.

8.0 Conceptual Engineering and Capital Programming

The Capital Enhancement Program includes 11 capacity improvements at key locations along the publicly owned railroad right of way on the southern section of the Pacific Surfliner organized into two phases, each with measurable benefits for intercity passenger rail service in the corridor. (See Figure 9) Phase 1 includes double tracking and capacity improvements in Los Angeles, Orange, and San Diego Counties that construct double tracking, install new crossovers, and re-space signals to reduce block lengths (Projects 1 through-5). Phase 2 includes double track and third main track in Orange and San Diego Counties (Projects 6 through 10). Phase 3 involves positive train control from Moorpark to San Diego.

8.1 Project Identification

The following table lists the projects included in the Capital Enhancement Program.

Table 18 — Capacity Enhancement Program

Project Number	Project Name	Agency	Project Cost (in $1000)
1	LA to Fullerton Triple Track	CA Dept. of Transportation	$12,169
2	Orange County Crossovers	OCTA	$7,934
3	San Onofre to Pulgas Double Track	SANDAG	$80,452
4	Orange County Signal Re-spacing	OCTA	$4,629
5	Sorrento-Miramar Ph 1 Double Track	SANDAG	$32,541
6	Oceanside Station Stub Track 2	SANDAG	$13,666
7	Laguna Niguel Double Track	OCTA	$48,992
8	Orange Co Third Main	OCTA	$80,828
9	Sorrento Valley Double Track	SANDAG	$37,574
10	Poinsettia Third Main	SANDAG	$13,572
11	CA-Pacific Surfliner-PTC (Moorpark to San Diego)	SCRRA	$30,000

8.1.1 Project 1– Los Angeles to Fullerton Triple Track

The Los Angeles to Fullerton 3rd Track is a 15 mile project that runs from MP 147.3 to MP 163.5 (Segment 8 is from MP 157.4 to MP 158.8) and consists of eight buildable segments, six of which have been funded through the State of California. High Speed Intercity Passenger Rail (HSIPR) Track funding of Segment 8 will complete the project work from MP 157.4 to MP 158.8. Upon completion of Segment 8 the entire 15 mile triple track project is complete.

Construct a 1.4 mile third main track connecting to two three track mainline segments. Work includes, but not limited to, the installation of all necessary signal appliances, installation of bidirectional centralized traffic controls, construction of one at grade road crossing at Rosecrans/Marquart, grading of embankments, installation of retaining walls and utility culverts protection, and security fencing. BNSF forces and force account contractors will undertake necessary construction management and engineering services.

Schedule of Work:

Construction can begin approximately one month following completion of all agreement between State, BNSF and FRA and Notice to Proceed (NTP) and to be completed within 24 months. All construction permits have been obtained

8.1.2 Project 2– Orange County Crossovers

This project will create a new Control Point (CP) Stadium located railroad east of State College Boulevard in City of Anaheim at milepost 169.8 and install a new mid- to high-speed universal crossover. The new crossover is necessary to maintain and improve the reliability of the passenger rail service by providing additional operational flexibility. Currently, there are only four universal crossovers where trains can switch between two main tracks on the 42-mile Orange Subdivision. There are no universal crossovers available to prevent freight trains from reverse traveling between branch lines along the Orange Subdivision in Anaheim and Santa Ana. Lack of universal crossovers on the Orange Subdivision reduces the ability of trains to bypass blocked section of track by switching to the second main track.

Key project benefits include improved reliability and on-time performance, increased average speed, and trip time reduction. When the project is complete, there will be an additional location where trains can cross over between the two main tracks on the Orange Subdivision, offering additional operational flexibility and reducing cascading delays by allowing one train to run around another that has been delayed or stopped due to equipment failure or other factors. Project will also create new CP 4th Street in the City of Santa Ana at milepost 174.7

and powered #10 turnouts to the Union Pacific Railroad (UPRR) industry leads at both CP 4th Street and CP Stadium. The new powered turnouts to the UPRR industry leads will improve operation and reliability of intercity passenger trains by allowing UPRR local freight movements to more quickly switch on to and off of the main line, reducing the time that local freights are occupying the two main tracks, and improving on-time performance of intercity passenger trains while allowing for increased speed and frequency.

8.1.3 Project 3– San Onofre to Pulgas Double Track

The project will provide approximately 5.8 miles of new second main track adjacent to the existing main track. The proposed project is located in San Diego County within the U.S. Marine Corps Base, Camp Pendleton. The project limits are from CP San Onofre to CP Pulgas on the San Diego Subdivision of the San Diego Northern Railway (SDNR). All improvements will be located within the existing NCTD right-of-way. There is existing double track located both north and south of the proposed project limits. When this project is completed, there will be a 16.1 mile stretch of double track from CP Songs (MP 209.2) to CP East Brook, (MP 225.3). Also included in the project is the reconfiguration of CP San Onofre to a universal crossover. The location of the universal crossover will be optimized based on operational analysis performed during design of the project. Amtrak has trackage rights to the corridor through master agreements with NCTD. This project is consistent with the California State Rail Plan (2007-2008 to 2017-2018) and the San Diego 2030 Regional Transportation Plan.

8.1.4 Project 4–Orange County Signal Re-spacing

This project includes the installation of two new Control Points on the Southern California Regional Rail Authority's Orange subdivision at CP Yale (MP 181.6) and CP Alicia/Galivan (MP 189.3) as well as respacing of intermediate signals. This project will shorten the length of each signal block, allowing trains to run closer to each other while maintaining a high level of safety. CP Galivan (MP 189.3) will break up the existing 5.5 mile long block between CP Bake (MP 186.7) and the newly installed CP Solow (MP 192.2). CP Yale (MP 181.3) will break up the existing 5.6 mile long block between CP Aliso (MP 178.9) and CP El Toro (MP 184.5). The project also involves significant upgrades to the signal system at existing control points, including implementation of sectional release and replacing of electrocode repeaters on the Orange Subdivision.

This portion of the Pacific Surfliner Corridor is approximately 42 miles long and currently has approximately 27 intermediate and control point signals (average of every 6,500 to 7,000 feet). A study was performed in October 2007 to determine the practical train headways under the existing signal system and the signal delays for individual signals were prioritized to identify where signal blocks should be shortened. It was determined that, in general, an average wayside signal spacing of 5,000 ft. blocks as opposed to the longer 6,500 to 7,000 ft. blocks is more desirable. The signal respacing will reduce traffic congestion and "bunching" of intercity and commuter trains during peak periods by allowing trains to operate on shorter headways while still maintaining a clear signal aspect. This project will improve on-time performance, increase speeds, and decrease trip time for intercity trains by reducing the likelihood of speed restrictions caused by an "approach" or "advanced approach" signal due to another train traveling ahead.

8.1.5 Project 5–Sorrento-Miramar Phase 1 Double Track

The project constructs 1.1 miles of double track and is located in the city of San Diego. The project limits are from CP Pines to a new control point; CP Miramar, which is proposed to be located approximately at MP 251 on the San Diego Subdivision of the SDNR. All proposed improvements will be located within existing NCTD right-of-way. Additional rail improvements include the installation of universal crossovers, signal and communication improvements, relocation of major utilities and safety improvements.

8.1.6 Project 6– Oceanside Station Stub Track 2

This project will construct approximately 1,000 feet of station holding track at the Oceanside Transit Center (OTC), owned and operated by NCTD. OTC is a key intercity passenger station stop for Amtrak at MP 226.4 on the San Diego Subdivision. The entire limits of Project 6 are within NCTD's right-of-way including all work within the station for the platform and track and signal work to CP Escondido Jet., MP 227.2. Currently, the two track configuration at the station and the convergence of Amtrak intercity service and two commuter rail services, restricts daily train operations. A stub track will create a parking spot for commuter trains, allowing two intercity trains to meet and pass at the station, reduce intercity train run times and add capacity.

8.1.7 Project 7–Laguna Niguel Double Track

This project will add approximately 1.7 miles of second main track adjacent to the existing main track between MP 194and MP 195.7 in the city of Laguna Niguel. The Southern California Regional Rail Authority's Orange subdivision is currently a double-track main line between Fullerton and Laguna Niguel, transitioning to single track just south of the Laguna Niguel/Mission Viejo station, and continuing as a single track mainline for most of the remaining distance to San Diego. This single track segment limits the capacity and reliability of intercity and commuter train operations in the area. The proposed double track segment will increase capacity for existing and future rail traffic. Currently, many of the southbound trains are required to wait at the Laguna Niguel station to allow for the opposing northbound train to clear the single track to the south. The potential for these conflicts is further increased when trains become delayed in San Diego and south Orange County and are, therefore, not in their assigned or usual time slots. Construction of the second main will help to minimize this conflict and, therefore, improve on-time performance. This proposed double track segment is expected to reduce the travel time by up to 56 percent in "wait time" for Amtrak Pacific Surfliner trains and by as much as 71 percent in "wait time" reduction for Metrolink over existing service."

All improvements will be located within the existing OCTA right-of-way.

8.1.8 Project 8 – Orange Co Third Main

The Irvine Third Main Track project will construct approximately eight miles of third main track on the Southern California Regional Rail Authority's (SCRRA) Orange Subdivision through the City of Irvine.

Construction of a third main track through this area will improve operational flexibility and allow a greater variety of service patterns, such as skip stop or express services, which would help to attract additional ridership. The project will also allow intercity trains to bypass slower moving freight trains traveling between San Diego and Orange on this extended section of track, improving reliability and speed of intercity passenger services, and potentially allowing increased service frequency. This project improves the cost-effectiveness of the corridor by reducing travel time and improving on-time performance by providing additional track capacity and operational flexibility. Passenger surveys in the corridor consistently rank on-time performance and trip time as key factors in a traveler's decision to make a trip by rail rather than by car. This project would make improvements in both areas, and would make rail travel a more attractive transportation alternative in the corridor.

8.1.9 Project 9 – Sorrento Valley Double Track

Project 9 will construct 1.1 miles of double track and is located in the city of San Diego at the I-5/I-805 split in a light industrial and professional area known as Sorrento Valley, in the upper reach of the Los Penasquitos Lagoon. The entire project is within NCTD operational right-of-way between Mile Post (MP) 247.7 and CP Torrey, MP 248.8. The project will raise the tracks by approximately five feet, placing it three feet above the 50 year floodplain; extend the current

double track north approximately 1.1 miles; relocate CP Torrey to its new location; replace three old timber trestles; construct retaining walls along the easterly right-of-way line; and modify the existing parking lot and station platforms. All work is intended to avoid the environmentally sensitive areas to the west and north through the lagoon area.

8.1.10 Project 10 – Poinsettia Third Main

This project will construct 1.1 miles of thru-track in city of Carlsbad, San Diego County, and extends from just north of the NCTD Poinsettia COASTER commuter rail station (MP 233.2) south to MP 234.5, just north of Batiquitos Lagoon. The Poinsettia station currently has two passenger platforms connected by two at-grade pedestrian crossings. As required by railroad operating rules, no train can proceed through the Poinsettia station while passengers are being loaded and unloaded. As a result, Amtrak intercity trains must stop to meet COASTER trains outside the station several times each day. The project will construct a new 6,000-foot segment of third track and a pedestrian underpass connecting the platforms. Since this is 90 mph territory, slowing, stopping and waiting for trains at the station can add close to five minutes to Amtrak's run time. The project will allow intercity trains to proceed through the Poinsettia station safely while still maintaining a high rate of speed.

8.1.11 Project 11 – Positive Train Control Moorpark to San Diego

This project provides PTC on the publicly-owned rights-of-way in the Pacific Surfliner Corridor from Moorpark to San Diego. PTC will benefit rail service along the Corridor while also strengthening future intercity passenger rail connections to the California High-Speed Rail System. Key project benefits include improved reliability, on-time performance, safety and trip time reduction. The project may also allow an increase in average speed for passenger rail from 79/90 to 90 mph or possibly up to 100 mph. The railroads in Southern California have committed to substantial completion of PTC by the end of 2012.

The project includes software development, acquisition of communications and radio spectrum, GPS systems, new computer-aided train control and dispatch systems, installation of wayside equipment along the right-of-way, signal relocations, installation of on-board equipment in the locomotives and cab cars, integration and testing of the system, training of railroad staff and operation and maintenance contractors to operate and maintain PTC and finally design and construction of a new train control and operations support facility to house the PTC dispatch, network management, and control equipment and provide necessary training facilities.

8.2 Cost Estimates

The projects assembled for this study include project estimates developed by the Department, OCTA and SANDAG. Each agency generally follows a similar process to determine costs. The basis for the estimate starts with defining the purpose of the estimate being prepared (specific phase of project, i.e., initial study, preliminary design, project options, or final design), the project scope, pricing basis, allowances, assumptions, exclusions, cost risks and opportunities, and any special consideration outside of standard practices. Estimates are calculated based on a mix of construction costs data including average unit prices for work and materials, benchmarking, difficulty of work, unique factors and market trends.

Estimated costs for the Pacific Surfliner Corridor Enhancement Projects are as follows:

Table 19 — Pacific Surfliner Capital Program Cost Estimate

PACIFIC SURFLINER/PTC CAPITAL PROGRAM
Cost Estimate by Year

Project Name							Project Cost
Pacific Surfliner Capacity Enhancements	2011	2012	2013	2014	2015	2016	
10 TRACK STRUCTURES & TRACK	$ 15,422,700	$ 51,472,651	$ 42,662,511	$ 14,638,739	$ 10,031,234	$ -	134,227,834
20 STATIONS, TERMINAL, INTERMODAL	$ -	$ 4,838,574	$ 498,825	$ -	$ -	$ -	5,337,399
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$ -	$ -	$ -	$ -	$ -	$ -	0
40 SITEWORK, RIGHT OF WAY, LAND, EXISTING IMPROVEMENTS	$ 9,068,475	$ 7,791,398	$ 7,633,870	$ 4,330,636	$ 4,086,056	$ -	32,910,434
50 COMMUNICATIONS & SIGNALING	$ 3,949,159	$ 10,924,872	$ 7,464,513	$ 3,720,322	$ 3,218,354	$ -	29,277,220
60 ELECTRIC TRACTION	$ -	$ -	$ -	$ -	$ -	$ -	0
70 VEHICLES	$ -	$ -	$ -	$ -	$ -	$ -	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-60)	$ 15,849,559	$ 24,238,535	$ 18,106,254	$ 5,178,188	$ 3,008,739	$ 714,642	67,095,917
90 UNALLOCATED CONTINGENCY	$ 9,613,254	$ 22,704,756	$ 17,030,061	$ 4,831,254	$ 3,002,380	$ 861,014	58,042,719
100 FINANCE CHARGES	$ 1,663,500	$ 1,821,975	$ 1,768,422	$ 87,652	$ 102,820	$ 21,525	5,465,895
Total - Pacific Surfliner Capacity Enhancements							$332,357,418
PTC							
50 COMMUNICATIONS & SIGNALING	$ 14,250	$ 14,750	$ 7,000	$ 2,000			38,000
80 PROFESSIONAL SERVICES (applies to Cats. 10-60)	$ 5,671	$ 5,000	$ 2,500	$ 2,400			15,571
Total - Pacific Surfliner PTC							$53,571
TOTAL PROJECT COST							$332,410,989

8.3 Project Schedule and Prioritization

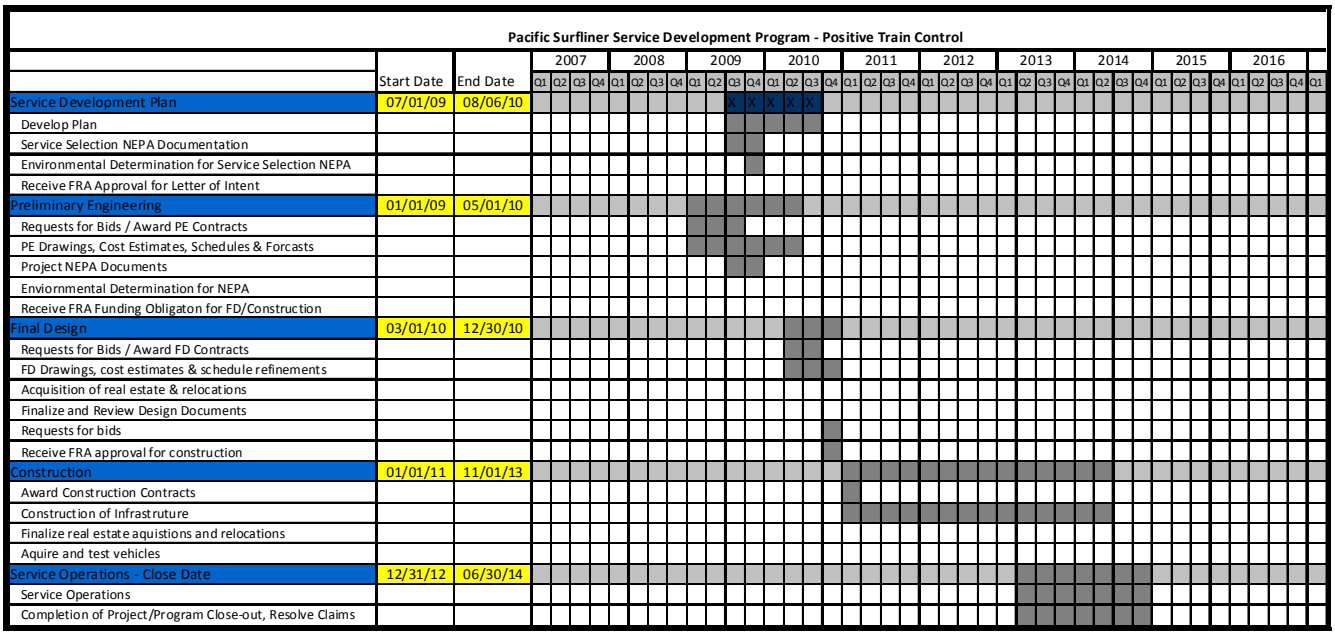
8.3.1 Phasing of Capital Projects

Sequencing of capital projects will be driven by a number of factors. Completion of design, environmental clearance and construction varies with the nature and complexity of the project. Not all of the requested projects will be funded at the same time and if several projects in the same segment of the rail corridor are ready for construction in the same timeframe it is likely that some phasing will be required. A primary concern would be to continue to operate all trains with a high degree of reliability, recognizing that some projects can be constructed under traffic conditions while others will require windows of time when existing track adjacent to a new track will be closed to traffic (for limited periods) to permit construction to proceed at a reasonable pace. Some portions of the 24-hour day will have much lighter train traffic and would be more conducive to longer periods where a single track portion of the main line could be closed to train movements.

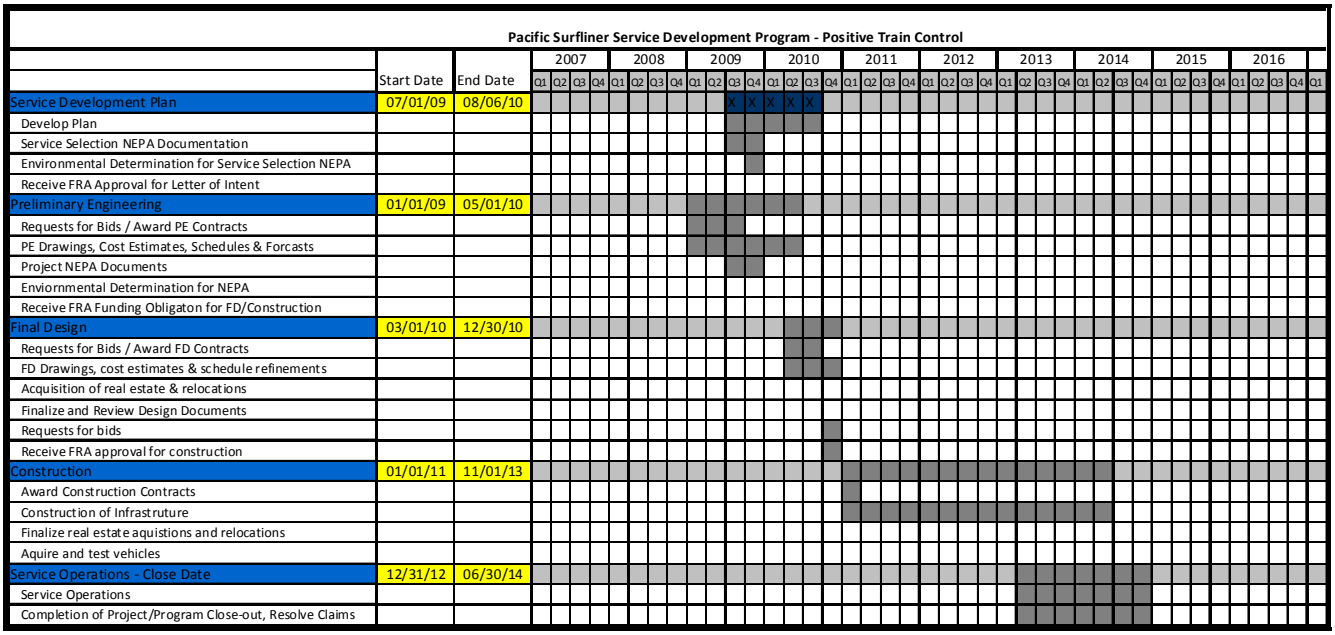
Completion of sufficient capital improvements are often required to facilitate train service frequency increases and/or to permit operational improvements, such as faster train speeds, reduced travel time, improved on-time performance and dispatcher flexibility in routing trains (especially when mechanical other incidents could impact train operations). Thus, the implementation of the requested capital program will create the infrastructure needed for the operational improvements.

Completion of the capital program, or a set of projects within a corridor segment, will permit the State to negotiate the service improvements with the host railroad and to discuss with Amtrak how the train service improvements can best be implemented.

It is anticipated that the projects identified in the service development plan could be undertaken with a progression of starting dates. Multiple projects would be in construction throughout the corridor.



The work required for positive train control is anticipated to proceed on a schedule independent of the corridor enhancement projects. The PTC schedule is presented below.

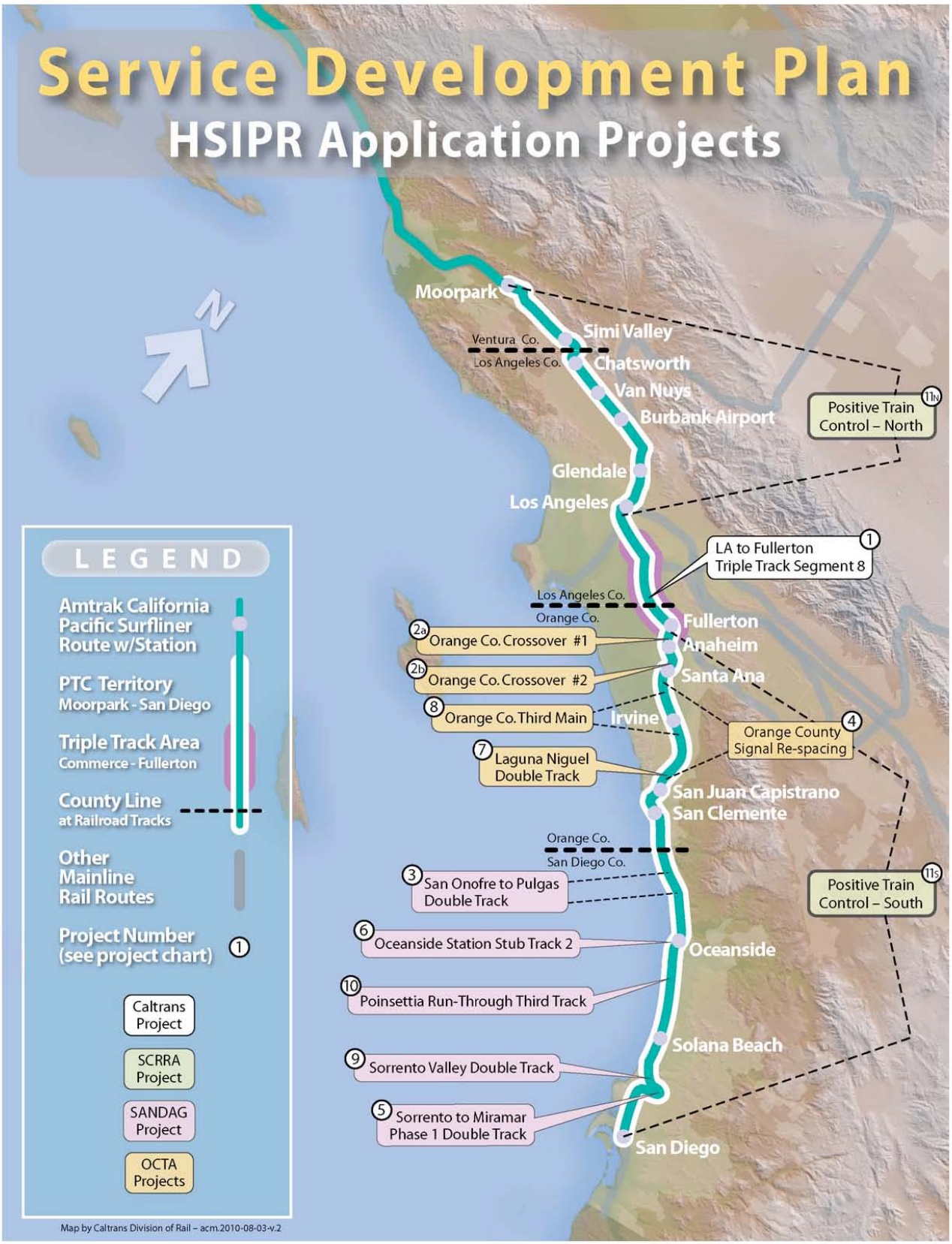


8.4 Conceptual Engineering Design Documentation

Developing final design documentation is required as a project phase element for implementing the projects in this SDP. Each project phase will require the development of specific design documents, associated environmental disclosure under NEPA, potential environmental permitting, and construction. Plans and specifications will be submitted to the FRA for approval prior to phase completion as shown in the project schedules.

The Pacific Surfliner service development projects are shown in Figure 9. Identified are the locations of the ten corridor enhancement projects and the limits of the positive train control territory.

Figure 9 — HSIRP Application Projects



9.0 Operating and Maintenance Costs and Capital Replacement Forecast

9.1 Costing Methodology and Assumptions

9.1.1 Maintenance of Way (MOW)

The Department pays Maintenance of Way costs through the Amtrak Operating Contract, based on trains and train miles operated Amtrak pays a portion of the host railroads total MOW costs. The Department's Intercity MOW costs are projected using total intercity MOW costs divided by total track miles (including main tracks and sidings) to determine the intercity MOW cost per track mile. 2010 Intercity MOW costs on the Pacific Surfliner corridor are estimated to be $3,052 per track mile.

PTC MOW costs are in addition to the corridor wide signal and communications MOW costs shown above. Because PTC has not been installed in a corridor similar to the Pacific Surfliner, final PTC maintenance costs are not fully known. PTC is expected to add $5,000 per route mile to the existing signaling costs for the host railroad, the Department's train services account for 23% of the service operated, resulting in $1,150 per route mile additional intercity cost to maintain the PTC system.

All MOW costs are escalated by four percent per year. The only increase in operating costs identified is the MOW costs shown above.

9.2 Summary of Operating Costs

All operating costs are based on the demand and revenue projections shown in Chapter 5. The assumptions used to develop these numbers are discussed in Chapter 5. Expense, Revenue, Loss and Revenue/Cost ratio is shown for base year, project completion, fifth and tenth years.

Table 20 — Summary of Operating Costs

Numbers in Millions	2010	2011	2014	2018	2023
Expense	$65.45	$67.41	$73.66	$82.91	$96.11
Revenue	$38.27	$40.50	$53.39	$64.72	$77.33
Loss	$27.18	$26.91	$20.27	$18.19	$18.79
Revenue/Cost Ratio	58%	60%	72%	78%	80%

9.3 Route Profit and Loss Statement

See above.

9.4 Capital Replacement Costs

Not applicable.

10.0 Public Benefits Analysis

10.1 Operational and Transportation Output Benefits

Key project benefits for the corridor's existing intercity service include improved reliability, on-time performance and safety, increased average speed, and trip time reduction. Currently, overall on-time performance of the passenger rail service in the project area is 75 percent. On-time performance is forecast to increase to 90 percent once these corridor programs are implemented. This corridor enhancement program will help to increase the reliability of rail service and accommodate additional services, including new limited-stop "express" intercity trains operated by Amtrak. Reduced end-to-end travel time will allow for optimized equipment rotation, enhancing the cost-effectiveness of intercity operations in the corridor.

In addition, the completion of this program will enhance intercity travel options; increase capacity and goods movement and strengthen future intercity rail connections to the California High-Speed Rail System. Amtrak, Metrolink and COASTER will all act as important rail feeder services to the future California High-Speed Rail system, transporting passengers from San Diego, Riverside, San Bernardino and Orange counties to either the Anaheim Regional Transit Center or Los Angeles Union Station, both key rail hubs for high-speed, intercity, and commuter passenger rail services.

These operational benefits would be shared with freight and commuter passenger rail services. Freight trains, which account for 8 to 9 percent of the traffic volume in the project area, are operated by BNSF Railway under a shared-use agreement with OCTA, NCTD and SCRRA. This agreement and service would be maintained after the project is completed. The corridor is also utilized by Metrolink Orange County and Inland Empire-Orange County (IEOC) Lines and COASTER trains in San Diego County, which also will see improved potential for service increases and performance benefits due to this corridor program.

Intercity Travel Options: Over the next 20 years, Southern California is projected to grow by 3.4 million residents. This translates into growth of intercity travel by 24 percent. According to the Purpose and Need for improvements in the corridor, the region's existing transportation network of rail, highway, and air services is currently operating at or near its design capacity, and building additional capacity is both expensive and increasingly problematic. Improvements to the LOSSAN rail corridor would improve passenger rail travel between Los Angeles and San Diego, provide for a better interface with transit and highways, and provide added capacity within a multimodal strategy to help meet increases in intercity travel demand in the region. Passenger surveys in the corridor consistently rank on-time performance and trip time as key factors in a traveler's decision to make a trip by rail rather than by car. This project would make improvements in both areas, and would make rail travel a more attractive transportation alternative in the corridor.

Integrated Rail Network: Improvements on the corridor would build upon an already strong intercity passenger rail network that includes connections to local bus and/or rail service at nearly every station. Los Angeles Union Station, for example, is a hub for Amtrak long-distance and Amtrak California passenger trains, Metrolink commuter trains, the Metro Red, Purple and Gold Line rail services, LAX Flyaway bus service, and several bus services. In addition, corridor passenger rail services will act as an important feeder to the statewide high-speed rail system through connections at Anaheim, Los Angeles Union Station, and downtown San Diego. When the high-speed trains enter revenue service, both Amtrak Pacific Surfliner and commuter services will feed into the statewide system, allowing communities not along the statewide high-speed corridor to be connected to the service.

Intermodal Benefits: Improvements that increase capacity, reduce travel time, and improve reliability help maintain and attract ridership on the service. Additional ridership maximizes the cost-effectiveness of the State's investment by reducing operating subsidies, allowing funds to be used on other rail improvements or to expand service. This program would make rail

travel a more attractive transportation alternative in the corridor. Improvements to the corridor also would result in better connections to public transit services, including direct services to airports in Los Angeles, Orange, and San Diego counties, as well as key local bus feeder services to reach downtowns and other major activity centers.

State of Good Repair, Standards and PTC: The Corridor enhancement program will maintain the railroad in a state of good repair, as track and signal systems are upgraded and aging bridge structures are replaced as needed. The program also will upgrade track, signals, and communications systems to current standards. Southern California railroads have committed to substantial implementation of Positive Train Control (PTC) by 2012, with full implementation scheduled in advance of the 2015 federal mandate.

10.2 User and Non-User Economic Benefits

10.2.1 User Benefits

Currently, overall on-time performance of the passenger rail service in the project area is 75 percent. On-time performance between Fullerton and San Diego is forecasted to increase by 10 percent, to 85 percent once these corridor programs are implemented. The Capacity Enhancement Program will help to increase the reliability of rail service and accommodate additional services, including new limited-stop "express" intercity trains operated by Amtrak. Reduced end-to-end travel time will allow more optimized equipment rotation, enhancing cost-effectiveness of intercity operations in the corridor.

Over the next 20 years, Southern California is projected to grow by 3.4 million residents. This translates into growth of intercity travel by 24 percent. According to the Purpose and Need for improvements in the corridor, the region's existing transportation network of rail, highway, and air services is currently operating at or near its design capacity, and building additional capacity is both expensive and increasingly problematic. Improvements to the Pacific Surfliner Corridor would improve passenger rail travel between Los Angeles and San Diego, provide for a better interface with transit and highways, and provide added capacity within a multimodal strategy to help meet increases in intercity travel demand in the region. Passenger surveys in the corridor consistently rank on-time performance and trip time as key factors in a traveler's decision to make a trip by rail rather than by car. This program would make improvements in both areas, and would make rail travel a more attractive transportation alternative in the corridor.

Any improvements on the Pacific Surfliner Corridor would build upon an already strong intercity passenger rail network that includes connections to local bus and/or rail service at nearly every station. Los Angeles Union Station, for example, is a hub for Amtrak long-distance and Amtrak California passenger trains, Metrolink commuter trains, the Metro Red, Purple and Gold Line rail services, LAX Flyaway bus service, and several bus services. Corridor passenger rail services will act as an important feeder to the statewide high-speed rail system through connections at Anaheim, Los Angeles Union Station, and downtown San Diego. When the high-speed trains enter revenue service, both Amtrak Pacific Surfliner and commuter services will feed into the statewide system, allowing communities not along the statewide high-speed corridor to be connected to the service.

Improvements that increase capacity, reduce travel time, and improve reliability help maintain and attract ridership on the service. Additional ridership maximizes the cost-effectiveness of the State's investment by reducing operating subsidies, allowing funds to be used on other rail improvements or to expand service. This program would make rail travel a more attractive transportation alternative in the corridor. Improvements to the corridor also would result in better connections to public transit services, including direct services to airports in Los Angeles, Orange, and San Diego counties, as well as key local bus feeder services to reach downtowns and other major activity centers.

10.2.2 Non User Benefits

Environmental Benefits: The benefit of this program, and others that promote intercity rail, is the reduction of single-occupant motor vehicle travel and the resulting improvement to air quality and the decreasing congestion and petroleum consumption. Passenger rail service provides a significant contribution to reducing dependence on oil and reducing greenhouse gas emissions.

The environmental benefit of freight rail service in the region that replaces trucks on the road is also significant. Just one intermodal train can take more than 280 trucks off the nation's long-distance highways. If just 10% of the freight that currently moves by truck were diverted to rail, over one billion gallons of fuel would be saved.

The transportation sector is the state's largest source of greenhouse gases (GHG). The "Global Warming Solutions Act" (AB 32, 2006) requires the State's global warming emissions to be reduced to 1990 levels by 2020. Between 2002 and 2004 the transport sector annually accounted for approximately 38 percent of the State's total GHG emissions; the on-road portion alone (as distinguished from aviation, rail and water-borne) represented approximately 36 percent of total GHG emissions. Research shows that both carbon dioxide (CO2) emissions and energy use are reduced when rail travel is compared to the automobile. On a per passenger basis, trains emit 43 pounds of CO2 while cars emit 124 pounds. Energy use per passenger mile is 2,709 British Thermal Units (BTUs) with trains and 3,445 with cars. Intercity rail becomes increasingly more efficient as the number of passengers increase per train.

The Department preserves California's investment in State-owned rail cars and locomotives through frequent inspections and maintenance cycles. California has the largest fleet of State-owned rail equipment in the country. Rebuilt locomotives now meet EPA clean air standards. The Department is also improving the fuel efficiency and emission reduction of its State-owned locomotives. During the past decade the Environmental Protection Agency instituted a new emission requirement for diesel locomotives. The State owns 17 locomotives (15 EMD F59 and two General Electric [GE] units). All F59 locomotives used in the State-supported rail system, meet the Tier 0 requirements. The F59 locomotives were upgraded to Tier 0 before being required to do so. The two GE locomotives were overhauled in 2008, and brought up to Tier 0 standards. The F59 locomotives will receive Tier 2 engine kits for the main engines at their next overhaul which began in 2008. They will then emit 35 percent less NOx and less than half the particulates than previously allowed in Tier 1 at 25 percent less NOx and 33 percent less particulates than previously allowed in Tier 0. Additionally, the Head End Power (HEP) units on the locomotives, which generate electricity to supply power for lighting and utilities within the passenger cars, are being updated. All F59 locomotives are scheduled to be equipped with Automatic Engine Start Stop (AESS) systems within the next year. This system reduces excessive engine idling resulting in reduced exhaust emissions and fuel savings. To date five systems have been installed and preliminary analysis show a marked reduction in emissions and increased fuel savings.

Livable Communities:

Passenger rail service on the LOSSAN Corridor connects the central business districts of numerous cities and towns along the corridor, including downtown Los Angeles, San Diego, Santa Ana, and Irvine. These areas generally have a concentration of population and businesses within close proximity the existing rail stations. Two-thirds of Orange County's jobs and population are currently located within four miles of a passenger rail station. The increased use of these stations, driven by improvements to passenger rail service in the corridor, would facilitate continued growth of these urban centers. Currently, eight of the 12 rail stations served by Amtrak between Los Angeles and San Diego are located within walking or biking distance of high-density housing, with transit oriented development projects under development at two additional stations. The majority of the stations are also within walking or biking distance of central business districts or major retail centers.

By 2030, the Pacific Surfliner corridor will be home to more than 21 million residents, an increase of nearly 5 million since 2000, pointing to the need for a wide variety of housing choices, more affordability, more accessible public transportation services, more walkability, and a greater mix of land uses. Pacific Surfliner corridor agencies are improving connections between land use and transportation using smart growth principles. Rail stations serve as central activity centers that are integrated into communities. Examples of improved transit/land use integration and improved multimodal connections in the corridor include:

- Santa Barbara, California has an active program; Santa Barbara Car Free, encouraging alternative means to get to and from the intercity rail station including walking, biking, and a local electric transit shuttle.
- The Chatsworth Station, currently served by Amtrak intercity trains and Metrolink commuter rail service, will become a major bus/rail transfer point for the region in 2012 with the extension of the Metro Orange Line, a dedicated regional busway. LA Metro operates an on-site child care center. The adjacent regional bikeway will also be extended to provide an 18-mile dedicated east-west bikeway.
- Los Angeles Union Station is the intermodal transportation center for the Los Angeles area and includes direct connections between airport flyaway bus, local and commuter bus, Amtrak intercity and long distance trains, Metrolink commuter rail, Metro subway and light rail, and future high speed rail services. Each day, nearly 400 trains depart Union Station and last year, 1.2 million intercity passengers used Los Angeles Union Station.
- ARTIC will include direct connections between existing intercity, commuter, and future high-speed rail services, and bus connections. Transit-oriented development near ARTIC will integrate the station into the surrounding community.
- The City of Santa Ana in Orange County, California, is using local transportation funds to study the feasibility of local streetcar routes to integrate transit into the character of the local community, promote economic development, and provide first/last mile connections between the intercity and commuter rail station and downtown.
- The NCTD has developed a mixed use, high density master plan for the Oceanside Transit Center, a major transfer point between intercity, commuter, and light rail services and local bus, within walking distance to the City of Oceanside's proposed smart growth town center.
- Downtown San Diego is the region's administrative, legal, government, business, entertainment, and cultural center, with the largest centralized, high-density housing in the region. The Centre City Community Plan contains designated land uses that will allow people to live and work near transit in pedestrian-friendly neighborhoods. Pacific Surfliner connects directly with San Diego Trolley at the train station.

Economic Benefits:

This Capacity Enhancement Program and the PTC are expected to have two-tier economic benefits in the Southern California region: short-term local economic stimulus and long-term economic growth. The program is expected to create jobs in all sectors of the labor and technical professions needed to plan and construct these improvements. During the final design and the construction of the project, approximately 7,647 full-time jobs would be created in the construction and engineering sectors. In addition to the construction jobs, this project is likely to create jobs in other industries, especially in the service sector in Southern California, since the project will have positive effects on mobility. This program would bring additional economic benefits, namely time savings from reduced congestion, shorter travel times, and smoother goods movement in the Southern California region, which would be a vital contribution to the regional economy. Total project spending of $1084 million will sustain economic activity in Southern California of $867.4 million, generating nearly 5,486 annual full-time equivalent jobs with earnings of $289.4 million.

The State of California identifies a Disadvantaged Community (DAC) as any community where the median household income is below 80 percent of the statewide household income, relying

upon 2000 Census data. According to this definition, there are more than 84 disadvantaged communities in the six-county Southern California region. In 2000 there were 136,593 people employed in the construction industry in DACs. This represented 33 percent of the regional construction industry employment. Of the 4,900 jobs estimated to be created or preserved by the full program, nearly 2,200 will be in DACs.

10.2.3 Rail Safety

10.2.3.1 Pacific Surfliner Positive Train Control

The operating railroads that would benefit from PTC are Amtrak's Pacific Surfliner route which runs 24 trains each weekday, Metrolink's Commuter trains which run 97 trains each weekday, COASTER Commuter trains which run 22-26 trains each weekday, the BNSF Railway Company (BNSF) and the Union Pacific Railroad Company (UPRR) freight trains, which run about 65 trains daily. Stations in Southern California that will benefit from the Project include: Moorpark, Simi Valley, Chatsworth, Van Nuys, Burbank-Bob Hope Airport, Glendale, Los Angeles Union Station, Fullerton, Anaheim, Orange, Santa Ana, Irvine, Laguna Niguel/Mission Viejo, San Juan Capistrano, San Clemente Pier, Oceanside Solana beach and San Diego.

The PTC project was identified through the FRA assessment that Southern California is a national priority area for the implementation of PTC, due to its complicated operating system. The State supported IPR systems must also be in compliance with the Rail Safety Improvement Act of 2008, which mandates the installation of PTC on all passenger rail systems by December 31, 2015, or cease operation. Interoperability of hardware, software and communications networks across publicly and privately owned territory and on-board (“data of” or “displays of”) all trains will be a standard feature of the PTC system.

The PTC project will serve as an important step to sustain a robust passenger rail transportation network that improves operational reliability, on-time performance, reduces travel time, increases speed and capacity and enhances safety throughout the region. These improvements to current IPR, commuter and freight rail service along the Corridor, also strengthen future IPR connections to the California High-Speed Rail System through connector locations like the ARTIC and Los Angeles Union Station. When the high-speed trains enter into revenue service both the IPR and commuter services will feed into the statewide system, allowing communities along the corridor to be connected with local bus and/or rail service at nearly every station. Freight trains in the project area are operated under shared use agreements with the SCRRA member agencies. Under the Interstate Commerce Act of 1887, the agreements will remain in effect after the Project is completed. Many aspects of PTC are new technology and the railroads in Southern California have committed to substantial implementation by 12/2012 making the region one of the first in the country to operate with PTC.

In addition to the transportation and safety benefits to be derived from PTC, numerous rail improvement projects will provide public safety benefits to intercity passenger rail, freight operations and commuter rail operations in the PS Corridor. Proposed projects in this capital program that will enhance safety include: new double track segments; installation of CTC signal system and powered switches at key locations; bridge and turnout replacements; sealed corridor projects that include additional protection at grade crossings and barriers to vehicle incursions in the rail right of way; life cycle replacement of worn track components; installation of fiber optics to improve speed and reliability of train communications; and re-spacing of wayside signal components.

10.3 Benefits by Rail Service Type

Freight trains in the project area are operated by the BNSF under shared-use agreement with NCTD and with the SCRRA member agencies; and with the UPRR under shared use agreements with the SCRRA member agencies. These agreements and services would be maintained after the project is completed. The corridor is also utilized by the COASTER commuter rail and Metrolink Ventura County, Antelope Valley, 91 line, Orange County and Inland Empire-Orange County (IEOC) Lines, which would also benefit from the improved reliability and on-time performance, reduced travel time, and enhanced safety.

Connectivity to High-Speed Rail: Amtrak, Metrolink and COASTER will all act as important rail feeder services to the future California High-Speed Rail system, transporting passengers from San Diego, Riverside, San Bernardino and Orange counties to either the Anaheim Regional Transportation Intermodal Center (ARTIC), the southern terminus of the initial segment of the statewide high-speed train route or Los Angeles Union Station, a key rail hub for high-speed, intercity, and commuter passenger rail services.

Positive Train Control Benefits: The primary and immediate benefit of implementing PTC along the Pacific Surfliner Corridor is safety. The collision-avoidance properties of PTC will only make the Pacific Surfliner Corridor a safer service for its passengers, employees, and surrounding communities. Another benefit of PTC will be to allow Pacific Surfliner Corridor trains to operate up to 90 mph along straight, tangent track with the upgraded track infrastructure and grade crossing signal timing.

Appendix A: ARRA HSIPR Track 2 Pacific Surfliner Operations Analysis

AMERICAN RECOVERY & REINVESTMENT ACT
HIGH SPEED & INTERCITY PASSENGER RAIL
TRACK 2 FUNDING PROGRAM

PACIFIC SURFLINER CORRIDOR
OPERATIONS ANALYSIS

DRAFT TECHNICAL MEMORANDUM

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September 28, 2009

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1.0 EXECUTIVE SUMMARY

The American Recovery and Reinvestment Act (ARRA) of 2009 provides a unique opportunity for Southern California Transit and Rail Agencies to create a comprehensive regional plan of programmatic infrastructure improvements designed to maximize capacity, interconnectivity and trip time speed throughout the San Luis Obispo to San Diego (LOSSAN) Corridor. This technical memorandum is the second step in developing a comprehensive and holistic strategy for implementing infrastructure improvements along the LOSSAN corridor to benefit regional and high speed rail operations, through the funding made available in the ARRA. This memorandum provides a comparative view of identified projects along the corridor, (categorized into three columns discussed in the methodology section), and outlines how individual projects, or combination of projects, can benefit passenger service and performance along the corridor.

These infrastructure improvements will enable the region to provide an enhanced service profile meeting the requirements for High Speed Rail set out in the Federal Guidelines. The plans will provide for High Speed Rail operations on the LOSSAN Corridor in three of the federally defined fields:

- **Conventional Operation** - upgrading existing conventional routes to 79 MPH
- **Emerging High Speed Rail** - Providing additional track improvements and deploying safety systems to enable lines speeds up to 110 MPH.
- **High Speed Rail Regional** - Providing infrastructure improvements that are directly attributable to enabling High Speed train operations by elimination of crossings at grade.

The main purpose of this comprehensive strategy is to provide the required operational information for creating a corridor-wide Service Development Plan for the State of California to be incorporated into the federal stimulus applications for all Track 2 projects. This operations analysis is intended to validate the necessity and effectiveness of each High Speed & Intercity Passenger Rail (HSIPR) Track 2 project based on its operational value.

The analysis conducted in preparing this strategy was based on observations made on three infrastructure and service scenarios developed for the LOSSAN rail corridor simulation model. The three cases included:

- **Case 1** - Track 1 on Track 1 (Base Case): Existing service and 12 Orange County Intra-county trains on the corridor infrastructure assumed for the OCTA Metrolink Service Expansion Program (MSEP) and subsequent HSIPR Track 1 projects for the entire LOSSAN corridor.
- **Case 2** - Track 2 on Track 1: Year 2015/16 passenger train service level on Case 1 infrastructure. Service levels under this case include the OCTA Metrolink Phase 3 service enhancements, 2015 service projections for Coaster trains, and 2015/16 service projections for the Pacific Surfliner.
- **Case 3** - Track 2 on Track 2: Service levels assumed under Case 2 operating with all Track 2 projects identified by the corridor agencies.

Based on the analysis of these three cases with different service and infrastructure levels, the infrastructure projects identified for HSIPR Track 2 funding on the LOSSAN corridor are sufficient to accommodate the proposed service levels assumed for years 2015/16. The observations and analysis performed show that the infrastructure upgrades, especially ones in segment south of Los Angeles Union Station (LAUS) would be most effective in improving the on-time performance of all passenger services on the corridor. It can be assumed at this time that given the lack of specific information north of Los Angeles needed for coding into the model, the full effectiveness of the Track 2 projects might not be fully realized.

However, the projects that were reviewed as part of this analysis still prepare the corridor for speed increases and trip time reductions. This iterative series of improvements will enhance conventional passenger rail operations and safety. The completed Track 1 and 2 projects can serve as an effective platform for redefining service along the LOSSAN corridor, consistent with the strategic goals established in the State Rail Plan and providing convenient connections to the Statewide High Speed Rail network. The quality of life in the region will also benefit from an enhancement intercity transportation system that can provide more travel options for commuters and leisure travelers alike.

2.0 PURPOSE AND NEED

The opportunities presented for enhancing the passenger rail services operating along the San Luis Obispo to San Diego (LOSSAN) rail corridor, through the funding available under the American Recovery and Reinvestment Act (ARRA) of 2009, are significant. With all of the service expansions and enhancements that have been under study or design in recent years throughout the 350-mile corridor, at no other time in recent history has there been the potential to fund and construct such a wide array of improvements for passenger rail services in southern California.

The importance of generating a comprehensive and coordinated plan to implement and prioritize these improvements is the key to maximizing the operational gains received from this investment. Agreement and coordination of all the railroad right-of-way owners and operators along the corridor will be required in this comprehensive coordination plan and would include the following:

- San Diego Metropolitan Transit System (MTS)
- North County Transit District (NCTD)
- Southern California Regional Rail Authority (Metrolink)
- California Department of Transportation Rail Division (Amtrak California)
- Amtrak
- Orange County Transportation Authority (OCTA)
- BNSF Railway
- Los Angeles County Metropolitan Transportation Authority (LA Metro)
- Ventura County Transportation Commission (VCTC)
- Union Pacific Railroad

Input and coordination from additional stakeholders that include regional and local governments and transportation agencies will also be a key in presenting a unified strategy for enhancing rail service in the corridor.

2.1 THE PURPOSE

The main purpose of preparing this comprehensive strategy is to provide the required operational information for creating a corridor-wide Service Development Plan. This operations analysis will validate the necessity and effectiveness of each HSIPR Track 2 project based on its operational value.

The programmatic suite of projects being recommended in the LOSSAN applications for Track 2 funding are intended to build on the Track 1 projects and lay the groundwork for a comprehensive strategy to improve integrated rail service in Southern California. The Track 2 projects will enhance speed and remove significant portions of single track chokepoints. The proposed infrastructure improvements will also allow intercity and inter-county commuter feeder service to exploit the strengths of their component passenger delivery systems thus creating a robust distribution network for the high speed rail line.

This analysis allows for better positioning of the corridor as a whole for receiving the federal stimulus money made available in the ARRA and to be able to use this funding to provide infrastructure investments that provide improvements to operations from a holistic standpoint, focusing on integrated service delivery for the entire rail corridor not just specific segments. By developing a corridor-wide Service Development Plan, the projects can be prioritized to effectively meet the increased travel demand projected for the regional rail services following the implementation of the statewide high speed rail program. The implementation of this program will also serve to substantially reduce the travel time; increase reliability; and to enhance the safety and accessibility of these services in order for them to operate as an efficient feeder/distributor arm of the State high speed rail system.

2.2 THE NEED FOR IMPROVEMENTS

The strategic improvements recommended in the Track 1 funding applications are just the first step in creating a truly integrated rail service network. The continuing need for a strategic approach to investing in improvements along the LOSSAN corridor is demonstrated by the region's insufficient capacity to meeting the future projected travel demand in the corridor that is, in part, a result of the planned implementation of the statewide high speed rail system. There is also an additional need to address issues related to reduced reliability and increased travel times associated with increased congestion that arises from these capacity constraints. These strategic improvements would address each of the following:

- Projected growth in travel demand, both as an intercity and commuter rail system and as a feeder/distributor service to the statewide high speed rail network.
- Capacity constraints resulting in congestion, delays, lower reliability and longer travel times.
- Maximizing the cost-effectiveness of improvements to enhance passenger rail services along the corridor.

3.0 MODEL APPLICATIONS

The Berkeley Simulation Software Rail Traffic Controller (RTC) model (Model) was selected as the platform on which to conduct the operations analysis for the Track 2 funding application. The Model was selected because it provides a variety of analytical and reporting capabilities encompassing the range of information required for this analysis and can realistically simulate higher-speed train operations in a mixed-use operational environment (intercity, commuter and freight services). The Model can also accurately simulate passenger and freight operations based on train set performance characteristics along a specified corridor, including different geometric parameters and infrastructure configurations. The advantage of the Model is that it is designed as a flexible tool that can be further modified, refined and upgraded as needed to evaluate different operational and infrastructure assumptions and configurations. In addition, RTC is a federally designated modeling tool that the FRA recommends grantees utilize for the operations analysis of any rail-related funding application.

4.0 METHODOLOGY

This analysis is based on observations conducted on three infrastructure and service scenarios developed for the LOSSAN rail corridor simulation model. The network model used for this analysis was constructed using the Berkley Simulation Software's Rail Traffic Controller, which is the railroad operation model used for previous operation analyses for OCTA on the Metrolink Service Expansion Program (MSEP) as well as many other analyses in the industry. The three case scenarios in the LOSSAN rail corridor simulation model include:

- **Case 1** - Track 1 on Track 1 (Base Case): Existing service and 12 Orange County Intra-county trains on the corridor infrastructure assumed for the OCTA MSEP and subsequent HSIPR Track 1 projects for the entire LOSSAN corridor.

- **Case 2** - Track 2 on Track 1: Year 2015/16 passenger train service level on Case 1 infrastructure. Service levels under this case include the OCTA Metrolink Phase 3 service enhancements, 2015 service projections for Coaster trains, and 2015/16 service projections for the Pacific Surfliner.

- **Case 3** - Track 2 on Track 2: Service levels assumed under Case 2 operating with all Track 2 projects identified by the corridor agencies.

4.1 TRAIN CHARACTERISTICS

A consistent assumption across all cases was the train set technology and operating characteristics. Both train set performance characteristics and consist composition define the type of rail vehicle fleet that will be used in the services along the corridor. For all model cases, these parameters were based on the existing consists and train set equipment, including:

- For passenger services, trains powered by General Motors F59PHI and Motive Power MP36 locomotives capable of a maximum operating speed near 110 MPH.

- For freight services, trains by a range of motive power, but generally by General Electric Dash 9-44CW and General Motors GP-38 locomotives capable of maximum operating speeds near 70 MPH.

For the purposes of simulating the cases described above, the train set performance characteristics (i.e. tractive effort curve, braking effort curve, weight, etc.) are based on represented consists previously used in simulations of the Los Angeles to San Diego rail corridor for each passenger and freight train classification. These configurations are conservative assumptions that are representative of typical consists that have operated or are planned to be operated along the corridor. Specific assumptions are elaborated in more detail under the sections describing each case.

4.2 CASE 1 - TRACK 1 ON TRACK 1

Case 1 is considered the base case scenario, and is necessary for validating the conditions before the Track 2 improvements are implemented and is the network from which all subsequent cases are to be "based". To develop this, the Track 1 Project Case network used for the "Preliminary LOSSAN Economic Stimulus Operations Analysis" (conducted in June 2009), is utilized as the template. Modifications were made to this network to reflect the infrastructure assumptions submitted in the Track 1 packages to the Federal Railroad Administration (FRA) and the operational timetables are consistent with the improvement plans developed by the corridor agencies.

4.2.1 Infrastructure Assumptions

All Track 1 infrastructures on the Case were carefully reviewed against the final Track 1 project list prepared by Caltrans Division of Rail and modifications were made where necessary. Locations where changes were made to the original network (2009 infrastructure level) are presented below in a summary table and provides figure references to illustrate the improvement coded into the model.

Table 4.2.1 – San Luis Obispo to Santa Barbara

Rank ID	Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
SB1	Replace Cross Ties in Santa Barbara County; *(includes associated speed increases of approximate 19mph in each segment).*	Mileposts (MP) 288.1 and 292.6 MP 292.8 and 296.3 MP 296.9 and 305.8 MP 306.9 and 315 MP 319.8 and 331.8	4.2.1
SB3	Narlon, Concepcion, Grover Siding CTC Upgrades.	MP 320.73 and 322 MP 289.41 and 290.7 MP 260.35 and 261.62	4.2.1
SB2	Ortega Siding Extension and CTC Upgrades	MP 373.16 and 374.0	4.2.2

Figure 4.2.1 - Replace Cross Ties in Santa Barbara County & Siding CTC Upgrades

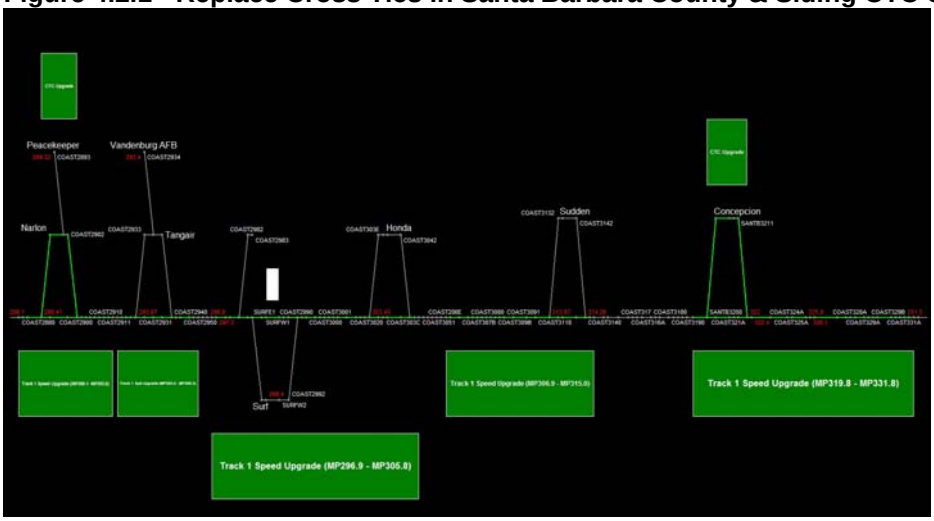


Figure 4.2.2 - Ortega Siding Extension and CTC Upgrades

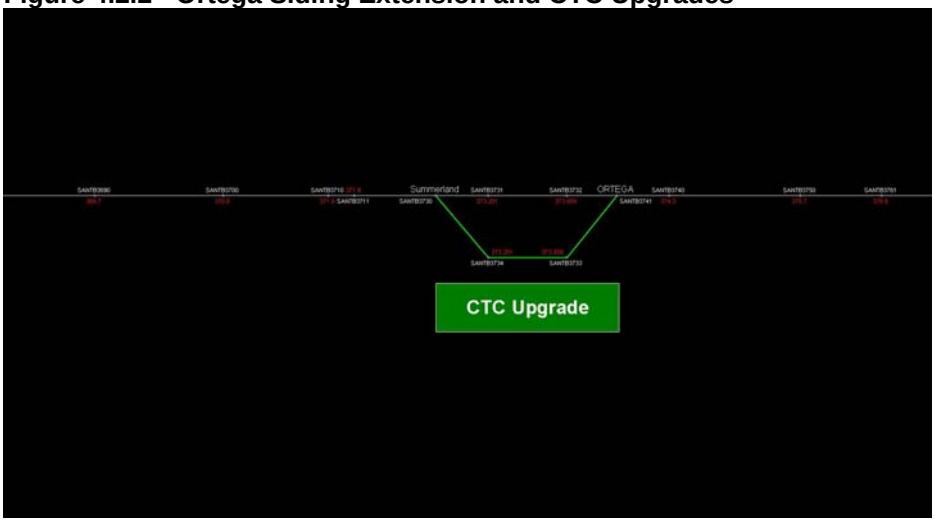


Table 4.2.2 – Santa Barbara to Los Angeles

Rank ID	Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
VC1	Track and Bridge Upgrades (Ventura County) Track 1; *There were no specific milepost locations or anticipated speed improvements provided with this project and therefore it was not able to be included in the simulation model.*	No MP locations provided	n/a
LA2	Signal & Wayside Detector Upgrades/Re-spacing (LA County) Track 1; *Signals in the model were not originally coded north of Los Angeles Union Station and therefore could not be tested in the model at this time.*	No MP locations provided	n/a
LA1	Access and Safety Improvements at Chatsworth Station; *Projects involved station safety enhancements that could not be modeled, and station signals, which also could not be tested since signals were not originally coded north of Los Angeles Union Station.*	MP 444.6 and 445.7	n/a

Table 4.2.3 – Los Angeles to San Diego

Rank ID	Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
LA3	Triple Track Los Angeles to Fullerton; *San Bernardino Subdivision between CP Vail and CP Buena Park (Source: Hobart to Basta Third Main Track; Track Alignment Schematic, 08-2006)*	Approx. MP 151.0 and 159.0	4.2.3
-	OCTA Metrolink Service Expansion (MSEP) - Fullerton Turnback Facility	MP 165.1 and 166.1	n/a
-	OCTA Metrolink Service Expansion (MSEP) – Laguna Niguel Turnback Facility	MP 192.4 and 194.1	n/a
OC3	Orange County LOSSAN Universal Crossovers and Additional Tracks; *Anaheim Universal Crossover (CP Stadium) and power Union Pacific Railroad (UPRR) industry lead switch.*	MP 170.3	4.2.4
OC3	Orange County LOSSAN Universal Crossovers and Additional Tracks; *Complete Universal Crossover at CP Lincoln and power UPRR industry lead at 4th Street.*	MP 174.7	4.2.5
OC3	Orange County LOSSAN Universal Crossovers and Additional Tracks; *Laguna Niguel Universal Crossover and Turnout (CP Galivan)*	MP 192.1	4.2.6
OC3	Orange County LOSSAN Universal Crossovers and Additional Tracks; *Orange Relief Siding*	MP 172.42 (Orange) and MP 4.7 (Olive)	4.2.7
OC5	Laguna Niguel to San Juan Capistrano Double Track	MP 193.9 and MP 196.8	4.2.8

Rank ID	Track 1 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
OC2	Orange County LOSSAN Signal and Wayside Detector Upgrades and including signal Re-spacing; *New CP Alicia and CP Yale*	MP 181.6 and MP 189.3	n/a
OC1	OC - Comm. upgrades incl. fiber/microwave to Stuart Mesa	Orange Subdivision	n/a
OC4	Orange County LOSSAN System-wide Track (concrete ties new rail) Upgrades	Orange Subdivision	n/a
SD1	San Diego LOSSAN Oceanside Station Stub Track - Project 1; *For Metrolink trains.*	MP 226.1 and 226.4	4.2.9
SD5	LOSSAN San Diego Los Penasquitos Lagoon Bridge Replacement	MP 246.1, 246.9 and 247.1	4.2.10
SD4	San Diego LOSSAN Sorrento-Miramar Alignment Improvement; *Provides speed improvements*	MP 251 and 252.9	4.2.11
SD3	San Diego LOSSAN Railroad Crossover Program; *Tecolote and Washington Street Universal Crossovers*	MP 265.3 and 263.5	4.2.12

Figure 4.2.3 – Triple Track Los Angeles to Fullerton

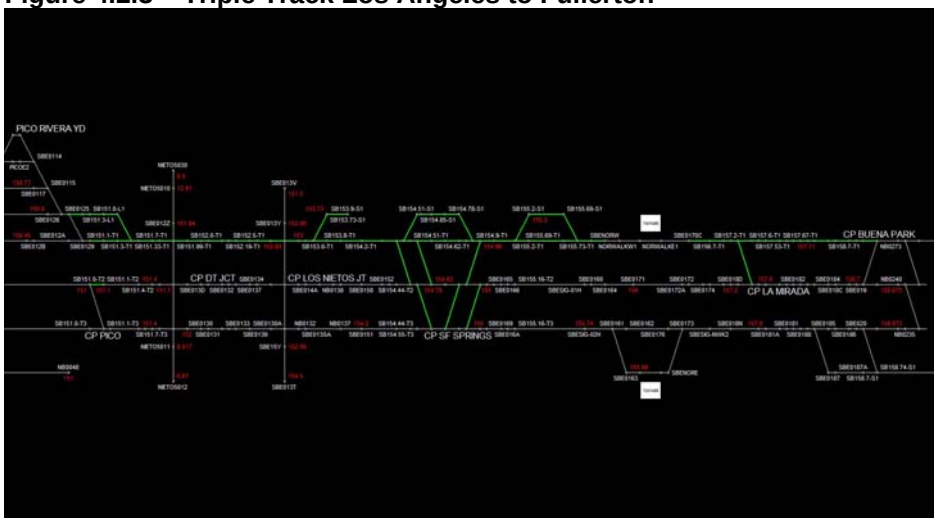


Figure 4.2.4 – Orange County LOSSAN Universal Crossovers and Additional Tracks (Anaheim)

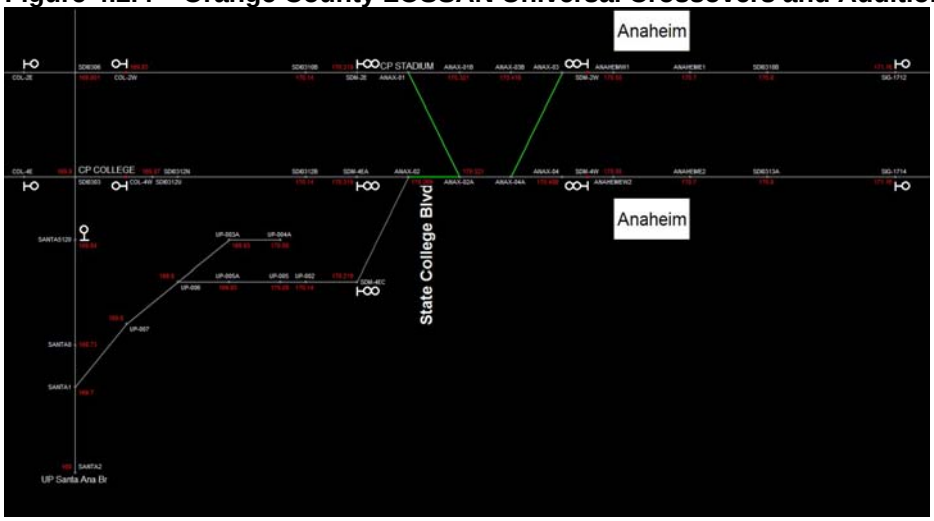


Figure 4.2.5 – Orange County LOSSAN Universal Crossovers and Additional Tracks (Santa Ana)

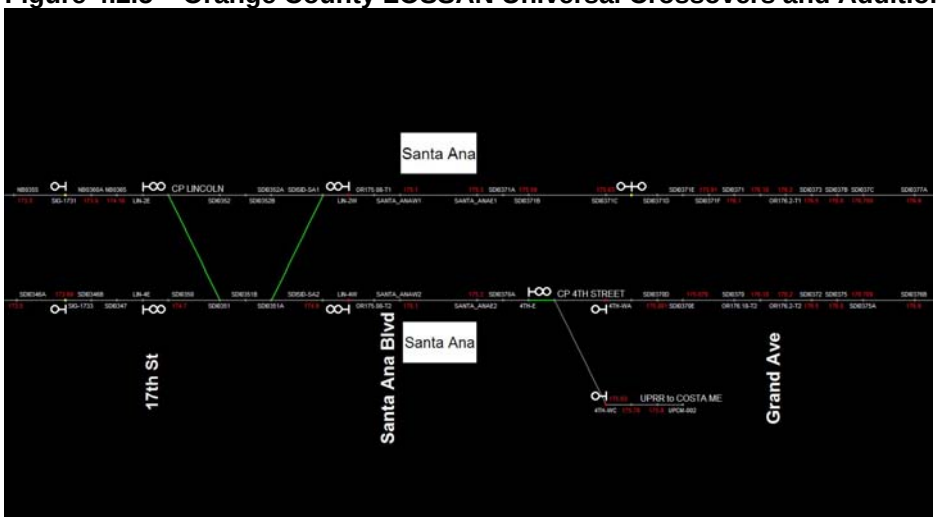


Figure 4.2.6 – Orange County LOSSAN Universal Crossovers and Additional Tracks (Laguna Niguel)

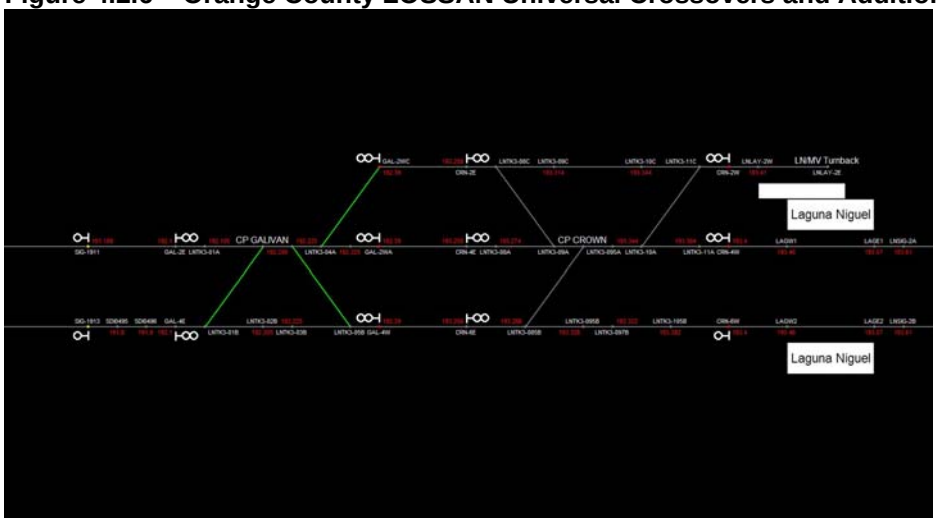


Figure 4.2.7 – Orange County LOSSAN Universal Crossovers and Additional Tracks (Orange Siding)

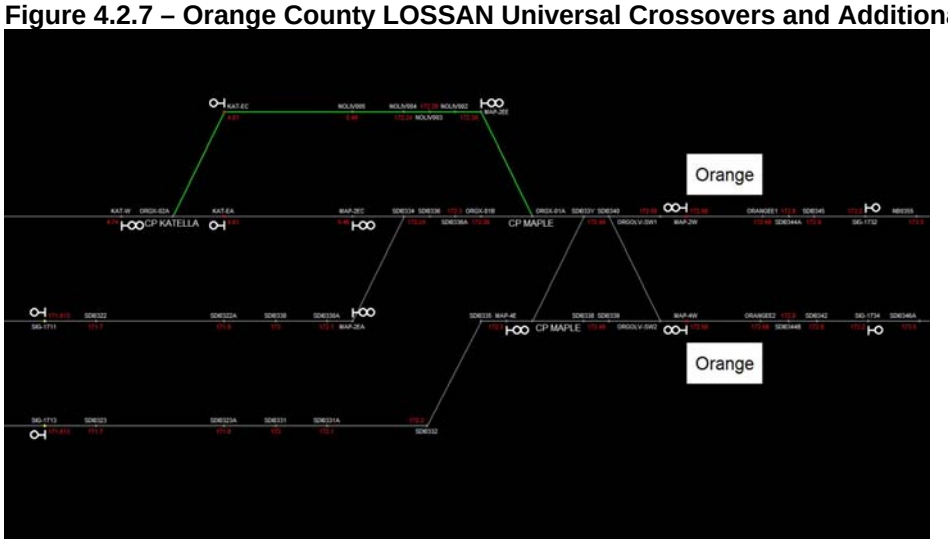


Figure 4.2.8 – Laguna Niguel to San Juan Capistrano Double Track

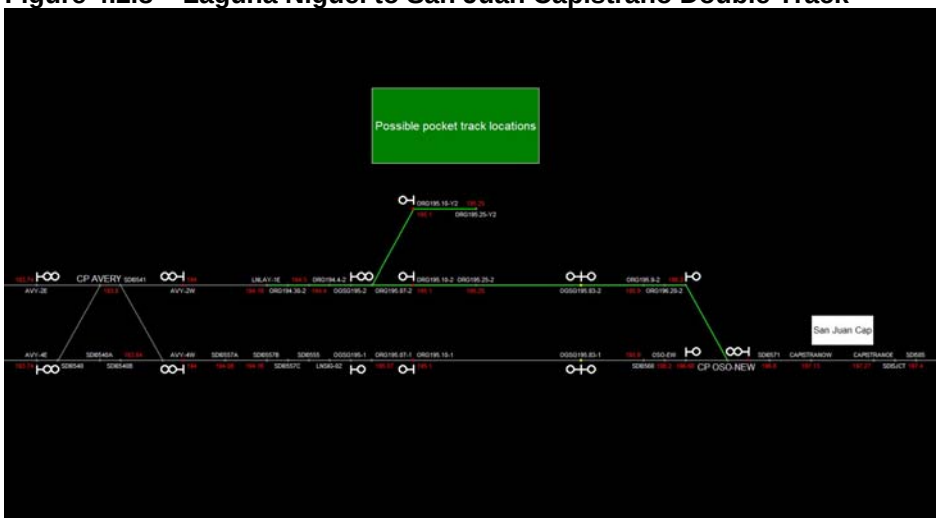


Figure 4.2.9 – San Diego LOSSAN Oceanside Station Stub Track - Project 1 (for Metrolink)

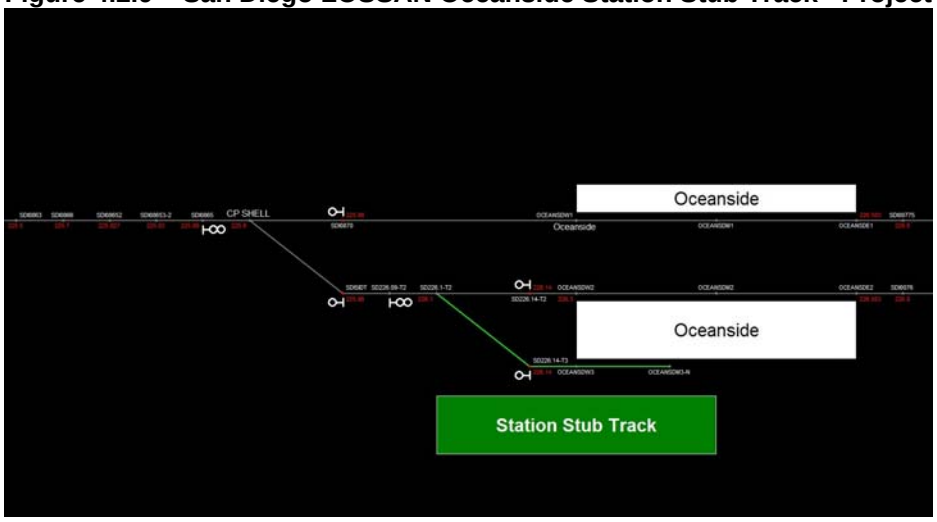


Figure 4.2.10 – LOSSAN San Diego Los Penasquitos Lagoon Bridge Replacement

Figure 4.2.11 – San Diego LOSSAN Sorrento-Miramar Alignment Improvement

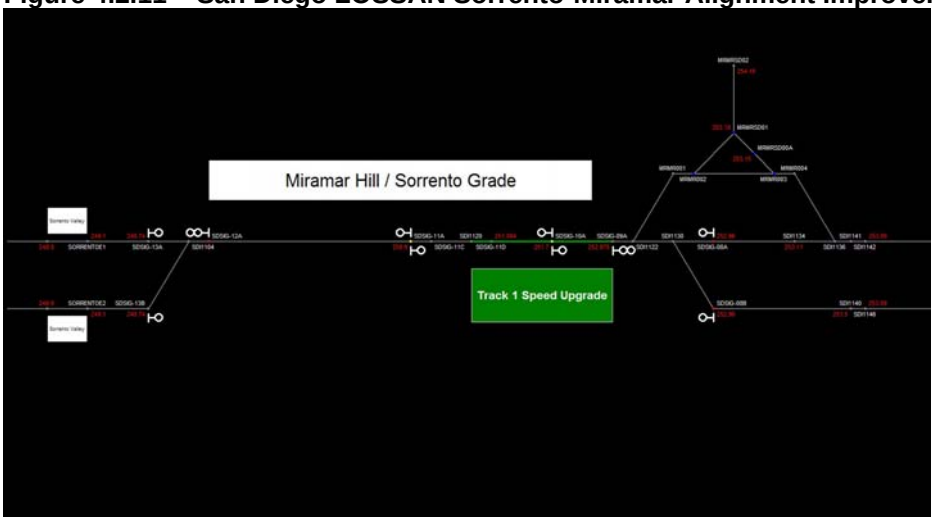
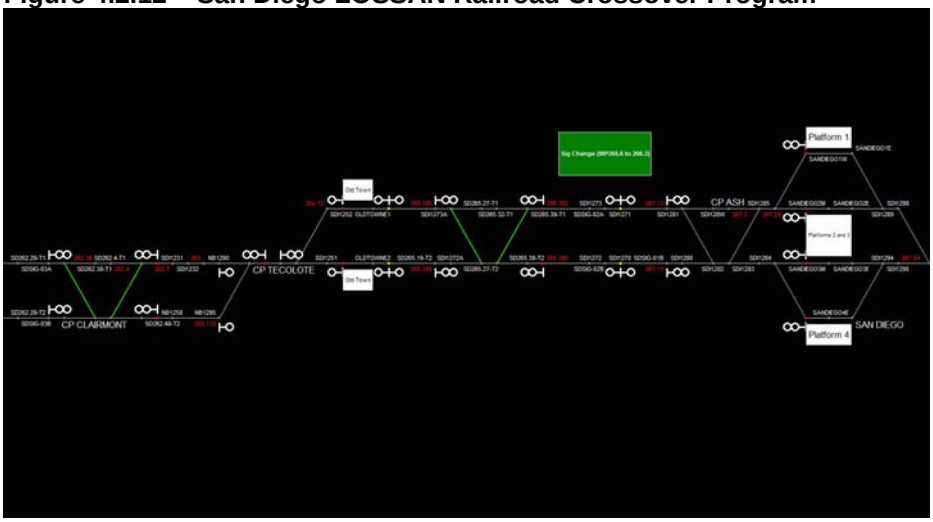


Figure 4.2.12 – San Diego LOSSAN Railroad Crossover Program



In addition to these additional infrastructure improvements, a detailed review of the network was then performed in order to ensure speeds and grades represented in the model would match those on the most recent track profile charts from Metrolink, the BNSF Railway (BNSF), and the Union Pacific Railroad (UPRR).

4.2.2 Operational Assumptions

There is a project duration requirement of the Track 1 funding application in which all projects need to be completed within 2 years from the grant award. The projected service plan for the year 2011/12 is used as the operational baseline for this case. Service assumptions have been determined as follows:

Table 4.2.4 – Track 1 Service Levels

Service/Operator	No. of One-Way Trips / Day	
	2008/2009	2011/2012
Amtrak Southwest Chief	2	2

Service/Operator	No. of One-Way Trips / Day	
	2008/2009	2011/2012
Amtrak Coast Starlight	2	2
Amtrak Pacific Surfliner	-	-
San Luis Obispo – Goleta	4	4
Goleta – Los Angeles	10	10
Los Angeles – San Diego	22	22
Metrolink Ventura Line	20	20
Metrolink Burbank/Bob Hope Service	10	10
Metrolink OC Line	19	19
Metrolink/OCTA Intra-County Service	-	12
Metrolink IEOC Line	16	16
Metrolink 91-Line	9	9
Coast Express Rail (Coaster)	22	22

Sources: NCTD, Metrolink, OCTA, Amtrak

In addition to these passenger rail services, freight trains were added based on actual observed BNSF train movements and operating condition along the LOSSAN corridor in 2007.

Modifications to Existing Service

In order to accommodate the Metrolink Orange County Intra-County service, the following modifications were made to selected trains along LOSSAN South corridor.

Table 4.2.5 – Metrolink Orange County Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
601	From Oceanside	4:43 AM	4:48 AM
603	From Oceanside	5:20 AM	5:18 AM
605	From Oceanside	5:50 AM	5:48 AM
689*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	5:10 PM
685	From Laguna Niguel/Mission Viejo	7:55 AM	8:00 AM
682	From Los Angeles Union	6:45 AM	6:40 AM
684	From Los Angeles Union	2:25 PM	2:20 PM
602	From Los Angeles Union	3:20 PM	3:00 PM
686	From Los Angeles Union	3:50 PM	3:30 PM
604	From Los Angeles Union	4:30 PM	4:20 PM

** Train(s) extended from Irvine to Laguna Niguel*

Table 4.2.6 – Metrolink IEOC Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
802**	From Laguna	(Originate from	1:35 PM

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
	Niguel/Mission Viejo	San Juan Capistrano)	
804	From Laguna Niguel/Mission Viejo	4:00 PM	3:50 PM
806*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	4:50 PM
808	Between Oceanside and San Juan Capistrano	-	3 minutes earlier
810	From Laguna Niguel/Mission Viejo	6:30 PM	6:20 PM
805*	From San Bernardino	5:22 AM	5:11 AM
807	From San Bernardino	5:57 AM	5:52 AM
811**	To Laguna Niguel/Mission Viejo	(Terminate at San Juan Capistrano)	(Terminate at Laguna Niguel/Mission Viejo)
813	From Riverside-Downtown	3:27 PM	3:12 PM

** Train(s) extended from Irvine to Laguna Niguel/Mission Viejo*
*** Train(s) shortened from San Juan Capistrano to Laguna Niguel/Mission Viejo*

Table 4.2.7 – Metrolink 91-Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
701	From Riverside-Downtown	5:29 AM	5:00 PM
703	From Riverside-Downtown	6:29 AM	6:24 AM
707	From Riverside-Downtown	5:49 PM	6:00 PM
702	From Los Angeles Union	6:25 AM	6:20 AM
704	From Los Angeles Union	12:45 PM	12:35 PM
706	From Los Angeles Union	4:20 PM	4:30 PM
708	From Los Angeles Union	5:25 PM	5:30 PM

Table 4.2.8 – Amtrak Pacific Surfliner Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
565	Between Irvine and Los Angeles Union	-	2 to 5 minutes later
567	Between Irvine and Los Angeles Union	-	2 to 5 minutes later
583	Between Oceanside and San Juan Capistrano	-	1 to 3 minutes
785	Between Oceanside and San Juan Capistrano	-	1 to 3 minutes
589	From San Diego	5:55 PM	5:50 PM

Train Number	Departure Location or Segment	Original Departure Time	Modified Departure Time
562	From Los Angeles Union	6:05 AM	6:10 AM
564	From Los Angeles Union	7:20 AM	7:10 AM
582	From Los Angeles Union	4:10 PM	4:20 PM
592	From Los Angeles Union	8:30 PM	8:20 PM

4.2.3 Model Output Results

Once the network was calibrated, an analysis was performed to identify conflict locations that presented impacts to schedule reliability and on-time performance. The observations made during the analysis for the Base Case are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- The existing operation plans are well designed with consideration of siding locations and time penalty for the manual control switches at sidings, only a few minor conflicts were observed. Owing to the installation of new CTC controls with powered switches at former manual sidings and the speed upgrades of the track infrastructure, delays caused by meets and passes are minimized. This would allow trip time reduction and create additional time buffer for passenger trains operated in this area.

Santa Barbara to Los Angeles

- Like the condition along the San Luis Obispo to Santa Barbara segment, the existing timetables between Santa Barbara and Los Angeles are developed based on the availability and location of the sidings so that delays associated with meets and passes are minimized along the primarily single track corridor. The scheduled pad provided in each of the timetables allows any delays caused by meets and passes to typically be absorbed at the end terminal.

- Although the significance of the delays is minor thanks to these practices, there are a few locations in Ventura County where numerous trains are observed being delayed while holding for opposing traffic. The most significant bottleneck was observed near the Simi Valley Station, where the station is located in a single-track section between two sidings. Here, several trains were observed being held at CP Santa Susana or CP Strathern to "wait their turn" serving the single track station.

- The single track segment between CP Raymer and CP De Soto and the single platform at the Van Nuys Station were observed to be a critical bottleneck in the corridor north of Los Angeles Union Station (LAUS). Since the Van Nuys station platform is available only on Main Track 2, outbound trains are held at CP Woodman to allow inbound trains to serve the station and pass.

Los Angeles to San Diego

- LAUS remains as a significant bottleneck, where all Amtrak and Metrolink trains (except the Inland Empire-Orange County [IEOC] Line) operate in and out of the 10-track station through 5 approach tracks. Most conflicts were observed to be caused by deadhead movements to and from the Central Maintenance Facility. These deadhead movements often conflicted with inbound trains during the morning peak period and outbound trains during the afternoon peak period.

- The completion of triple-track project between Redondo Junction and Fullerton Junction on the BNSF San Bernardino Subdivision eliminated most delays for passenger trains. However, the location of new crossovers lowers the operational flexibility because it does not reflect the entrance points of freight yards. For instance, there are only two ways to traverse trains between Hobart Yard and La Mirada Yard and only one way between Pico Rivera Yard and La Mirada Yard in the new configuration. This may cause additional rail traffic congestion and delays when freight traffic again increases.

- With the installation of additional crossovers in Orange County conflicts associated with freight train movements during the mid-day periods were reduced. The construction of a second track section along the Olive subdivision eliminated delays associated with outbound IEOC trains holding at the Orange Station for an inbound IEOC train to clear the Olive subdivision. This improvement reduced overall delays along the Orange subdivision. The extension of double track south of Laguna Niguel, reduced the delays associated with southbound trains holding for northbound trains to clear the single track segments. This double track extension provided an estimated 3 minutes per passenger seat mile of reduced delay. South of this second track extension, trains continue to be held at CP Capistrano and CP Serra, located at each end of the Serra siding. This siding is the only two track segment of corridor between the end of the double track extension and CP Songs (a distance of approximately 13 miles), creating a capacity constraint on the number of trains that can serve the south Orange County area, and impacting the on-time performance and reliability. However, the delay is typically absorbed by schedule pad and does not cause significant delays to be carried over to the BNSF territory north of Fullerton Junction.

- Relocation of the storage track at Laguna Niguel/Mission Viejo Station due to the southward double-track extension appeared to have minimal impacts to overall train operation, and did not impact the ability for the Intra-County trains to turn within their previously determined time slot.

- The signal re-spacing reduces traffic congestion and “bunching” during peak periods by allowing trains to operate on shorter headways while still maintaining a clear signal aspect.

- The Oceanside station “stub” track proposed for Metrolink trains improves the overall platform capacity at the Oceanside station. This capacity increases reduced the overall impact of delays by allowing Amtrak, Coaster and Metrolink to serve the station simultaneously. In the future, this capacity increase can also allow for Metrolink and Coaster timetables to be more integrated, allowing transfers from one service to the other.

- Coaster currently stores train sets on the second track between CP Westbrook and CP Eastbrook to free up platform space at Oceanside while turning the train sets (e.g. SDNR 645 and 654). This method of operation presents a capacity constraint by effectively single-tracking the corridor between CP Shell and CP Puller. This constraint was observed to primarily impact trains that were already delayed and operating outside of their designated time slots. These trains therefore were held and obtained an additional time penalty, which created delays for additional trains when their scheduled meet times were missed.

- An additional location where delays were observed was the single-track sections between the Solana Beach Station and CP Miramar. While the existing timetable is designed to minimize the delays associated with meets, again the constraints were observed to primarily impact trains that were already delayed and operating outside of their designated time slots. These trains forced trains that were operating on-time to take a time penalty while holding for the delayed train, therefore delaying the opposing train and impacting additional scheduled meet times.

4.3 CASE 2 - TRACK 2 ON TRACK 1

Case 2 involves incorporating additional passenger train trips proposed by the operators while the infrastructure is kept at the Base Case (Track 1) level. This case is intended to be the control sample of this operations analysis. A review of this case was performed in order to compare with the Track 2 Infrastructure Case (Case 3 – Track 2 on Track 2) to clarify the benefits and effectiveness of the Track 2 projects. This provides an opportunity to observe and find conflicts and operational chokepoints and determine if these locations are eliminated or reduced by the Track 2 projects.

4.3.1 Infrastructure Assumptions

The infrastructure assumptions for Case 2 are the same as presented in Case 1 – Track 1 on Track 1.

4.3.2 Operational Assumptions

Due to the requirements in the Track 2 funding application, the passenger train services on the corridor for this case are run according to the levels provided by the corridor agencies for year 2015/2016. Based on the long-range plans released or underway by the operators and the corridor agencies, service levels for this case are determined as follows:

Table 4.3.1 – Track 2 Service Levels

Service/Operator	No. of One-Way Trips / Day		
	Existing 2008/2009	Track 1 2011/2012	Track 2 2015/2016
Amtrak Southwest Chief	2	2	2
Amtrak Coast Starlight	2	2	2
Amtrak Pacific Surfliner	-	-	-
San Luis Obispo – Goleta	4	4	6
Goleta – Los Angeles	10	10	12
Los Angeles – San Diego	22	22	22 + 6 Express
Metrolink Ventura Line	20	20	20
Metrolink Burbank/Bob Hope Service	10	10	10
Metrolink OC Line	19	19	19
Metrolink/OCTA Intra-County Service	-	12	18
Metrolink IEOC Line	16	16	26
Metrolink 91-Line	9	9	9
Coast Express Rail (Coaster)	22	22	32

Sources: NCTD, Metrolink, OCTA, Caltrans Rail Division

For Amtrak, the travel times of the Pacific Surfliner trains have a Year 2020 travel time goal envisioned by Caltrans. The travel time goals for each segment and each service type are summarized below:

- Between San Luis Obispo and Goleta in 2 hours and 10 minutes
- Between Goleta and LAUS in 2 hours
- Between LAUS and San Diego in 2 hours and 30 minutes and 1 hour and 55 minutes, by limited-stop (8 stops) and Express (4 stops), respectively

Modifications to Existing Service

In order to accommodate the additional services proposed for the 2015/16 timeframe, schedule modification were made to selected trains along LOSSAN corridor from the Track 1 timetable.

Table 4.3.2 – Metrolink Orange County Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
601	From Oceanside	4:43 AM	4:48 AM	-
603	From Oceanside	5:20 AM	5:18 AM	-
605	From Oceanside	5:50 AM	5:48 AM	-
689*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	5:10 PM	-
685	From Laguna Niguel/Mission Viejo	7:55 AM	8:00 AM	-
OCN05	From Laguna Niguel/Mission Viejo	9:15 AM	9:20 AM	5 minutes later
OCN07	From Laguna Niguel/Mission Viejo	12:00 PM	11:35 AM	25 minutes earlier
682	From Los Angeles Union	6:45 AM	6:40 AM	-
684	From Los Angeles Union	2:25 PM	2:20 PM	-
602	From Los Angeles Union	3:20 PM	3:00 PM	-
686	From Los Angeles Union	3:50 PM	3:30 PM	-
604	From Los Angeles Union	4:30 PM	4:20 PM	-
688	From Los Angeles Union	4:50 PM	4:55 PM	5 minutes later
606	From Los Angeles Union	5:40 PM	5:55 PM	15 minutes later

Italics: Trains added in Track 1 Service Plan
* Train(s) extended from Irvine to Laguna Niguel

Table 4.3.3 – Metrolink IEOC Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
802**	From Laguna Niguel/Mission Viejo	(Originate from San Juan Capistrano)	1:35 PM	-
804	From Laguna Niguel/Mission Viejo	4:00 PM	3:50 PM	-
806*	From Laguna Niguel/Mission Viejo	(Originate from Irvine)	4:50 PM	-
808	Between Oceanside and San Juan Capistrano	-	3 minutes earlier	-
810	From Laguna Niguel/Mission Viejo	6:30 PM	-	10 minutes later
803	Arrival At Oceanside	7:15 AM	7:05 AM	10 minutes earlier
805*	From San Bernardino	5:22 AM	5:11 AM	-
807	From San Bernardino	5:57 AM	6:02 AM	10 minutes later

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
809	From Riverside-Downtown	7:26 AM	7:21 AM	5 minutes earlier
811**	To Laguna Niguel/Mission Viejo	(Terminate at San Juan Capistrano)	(Terminate at Laguna Niguel/Mission Viejo)	-
813	From Riverside-Downtown	3:27 PM	3:12 PM	-
850	Between Oceanside and Riverside-Downtown	-	(Discontinued)	-
851	Between Riverside-Downtown and Oceanside	-	(Discontinued)	-

** Train(s) extended from Irvine to Laguna Niguel/Mission Viejo*
*** Train(s) shortened from San Juan Capistrano to Laguna Niguel/Mission Viejo*

Table 4.3.4 – Metrolink 91-Line Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
701	From Riverside-Downtown	5:29 AM	5:00 PM	-
703	From Riverside-Downtown	6:29 AM	6:24 AM	-
707	From Riverside-Downtown	5:49 PM	6:00 PM	-
702	From Los Angeles Union	6:25 AM	6:30 AM	10 minutes later
704	From Los Angeles Union	12:45 PM	12:35 PM	-
706	From Los Angeles Union	4:20 PM	4:30 PM	-
708	From Los Angeles Union	5:25 PM	5:30 PM	-

Table 4.3.5 – Amtrak Pacific Surfliner Service Modifications (North of Los Angeles)

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time
785*	Arrival at San Luis Obispo	(Terminate at Goleta)	12:38 AM
589**	Arrival at Goleta	(Terminate at LAUS)	12:15 AM
784*	From San Luis Obispo	(Originate from Goleta)	11:25 AM
578**	From Goleta	(Originate from LAUS)	10:20 AM
704	From Los Angeles Union	12:45 PM	12:35 PM

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time
706	From Los Angeles Union	4:20 PM	4:30 PM
708	From Los Angeles Union	5:25 PM	5:30 PM

** Train(s) extended from Goleta to San Luis Obispo*
*** Train(s) extended from Los Angeles Union Station to Goleta*

Table 4.3.6 – Amtrak Pacific Surfliner Service Modifications (South of Los Angeles)

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time	Change from Track 1 Schedule
565	Between San Juan Capistrano and Los Angeles Union	-	(Same as original)	5 minutes earlier
567	From San Diego	8:10 AM	8:25 AM	15 minutes later
589	From San Diego	5:55 PM	5:55 PM	5 minutes later
562	From Los Angeles Union	6:05 AM	6:25 AM	15 minutes later
564	From Los Angeles Union	7:20 AM	7:10 AM	-
566	Between San Clemente Pier and Old Town	-	1 minute later	1 minute later
582	From Los Angeles Union	4:10 PM	4:05 PM	-

Table 4.3.7 – Coaster Service Modifications

Train Number	Departure Location or Segment	Original Departure Time	Track 2 Modified Departure Time
631	From San Diego	6:31 AM	6:21 AM
635	From San Diego	7:45 AM	7:15 AM
661	From San Diego	5:27 PM	5:32 PM
663	From San Diego	6:16 PM	6:05 PM
630	From Oceanside	5:18 AM	5:00 AM
634	From Oceanside	6:03 AM	6:20 AM
638	From Oceanside	7:15 AM	7:21 AM
640	From Oceanside	7:42 AM	7:39 AM
656	From Oceanside	3:29 PM	4:10 PM
662	From Los Angeles Union	4:30 PM	4:20 PM
664	Between Oceanside and San Diego	(Fridays only)	(Run daily as SDNR-S4)
671	Between San Diego and Oceanside	(Fridays Only)	(Run daily as SDNR-N4)

4.3.3 Model Output Results

Once the network was calibrated, an analysis was performed to identify conflict locations that presented impacts to schedule reliability and on-time performance. The observations made during this analysis for the Case 2 scenario are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- Additional service to Goleta and San Luis Obispo requires utilization of sidings which would not be powered by the Track 1 funding, specifically Waldorf Siding, in order to accommodate meets and passes. As a result, trains using this siding with manual switches are delayed due to time penalties incurred by having to throw the switches.

- The speed increases at five locations in this segment significantly shorten the travel time north of Santa Barbara. As a result, all trains operated in this segment except southbound Coast Starlight (#14) arrive at stations between 15 to 60 minutes earlier than they are currently scheduled.

- As a result of the Track 1 projects in this segment, run-times between San Luis Obispo and Goleta (based on the dispatched result with minimum of 1 minute dwell time at intermediate stations) was reduced to between 2 hours and 7 minutes and 2 hours and 20 minutes, depending on the time of day. The trip with the shortest run-time, since it was a late evening run, had no meets or passes occur in this segment. This shortest run-time is faster then the current average travel time of 2 hours of 15 minutes and slightly faster than the target travel time of 2 hours and 10 minutes, set by Caltrans Rail Division.

Santa Barbara to Los Angeles

- Based on the run-time results in the model output, trains travel between Goleta and LAUS between 2 hours and 30 minutes and 2 hours and 40 minutes with one-minute minimum station dwell time at all intermediate stations, except Santa Barbara where trains are scheduled to stop for 3 minutes. This is significantly faster than the existing scheduled run-time between 2 hours and 50 minutes and 3 hours and 10 minutes, but it does not yet meet the target trip time of 2 hours, set by Caltrans Rail Division.

- Absence of adequate passing sidings or double-track section in western Ventura County, specifically a section between Ventura Station and Camarillo Station is a source of conflicts and delay. Since Leesdale Siding is not controlled by CTC and there is only one platform at the Oxnard Station, only one location is available for meets and passes near the Ventura Station in this 30-mile segment.

- As with the Track 1 observations, the single-track section in Simi Valley between CP Stathearn and CP Santa Susana is the most critical bottleneck in Ventura County. Although delays on northbound trains tend to be absorbed by scheduled time buffer, several trains were observed being held at CP Santa Susana or CP Strathern to “wait their turn” serving the single track station.

- Single-track section between CP De Soto and CP Woodman is a bottle neck with increased Amtrak service. There are numerous occasions throughout the day when trains get held at CP De Soto, CP Raymer, CP Elliker and CP Woodman to meet and pass other trains from the opposite direction. The single-track operation at Van Nuys Station also creates conflicts and delays due to this competition over track availability.

Los Angeles to San Diego

- The run-times of the Surfliner express trains as presented in the model output showed trip times between 2 hours and 25 minutes and 2 hours and 30 minutes, while the local Surfliner trains operated between 2 hours and 35 minutes and 2 hours and 46 minutes. The express times present a faster travel time of approximately 15 to 20 minutes over the current Pacific Surfliner travel times, but do not meet the target trip time of less than 2 hours, set by Caltrans Rail Division

- Southbound additional timeslots during the evening peak period are hardly available, especially for the new Surfliner Express trains. This is because of increased Metrolink services, which compete for timeslots on the San Bernardino and Orange Subdivisions. As a result, the express trains were slotted within 5 to 10 minutes ahead of or behind departing Metrolink or local Amtrak services out of Los Angeles. Those express trains departing after a Metrolink train typically overtook that train in Norwalk or Buena Park. At least one of the express trains was also required to overtake a Coaster train in San Diego County in order to maintain on-time performance.

- Along segments of the Orange Subdivision, the Surfliner Express trains operate under limited speed signal indication to maintain the headway and avoid overtakes in Orange County, where the proposed train frequency prevents the ability to overtake without impacting opposing movements.

- Congestion in the single-track section between San Juan Capistrano and CP Songs significantly worsens in this Case, especially during the peak period, because of the Surfliner Express. Several trains are held at each ends of the double-track section in order to meet opposing trains.

- Increased Coaster train service and the Surfliner Express trains during peak periods worsen the on-time performance in San Diego mainly due to the lack of adequate passing siding lengths in San Diego County. The most critical bottlenecks appear near the Encinitas Station, where the station is located in a single-track section between two short double-track sections, and a section between Solana Beach and Sorrento Valley Stations, a five-mile single-track section near Del Mar. Delays caused by the capacity constraints at these locations trigger cascades of delays in sections north of Oceanside since the schedules are dependent on trains hitting their “slot” when coming into double-track operations in Orange County due to the increased train frequencies on Metrolink north of Laguna Niguel.

- CP Songs is still observed as the most critical chokepoint in northern San Diego County. Since there is no passing siding between CP Songs and CP Serra, located 8.5 miles apart, trains on both directions tend to get held at the end of double-track sections. Most of the delays caused in this area are delays which increase exponentially or “snowballed” delays, caused by missed meets and other delays occurred in either Southern Orange County or other parts in San Diego County. Similar conflicts are observed between CP San Onofre and CP Pulgas, a 6-mile long single track segment.

- With the increase in Coaster and Amtrak operations, the single track segments across the Santa Margarita and San Luis Rey Rivers impact peak operations and result in conflicts between revenue and deadhead movements, similar (though less severe) to the impacts at Los Angeles Union Station.

- With additional Coaster service, capacity of the daytime layover tracks in Downtown San Diego will exceed the capacity. While three train sets can be stored in the existing configuration, four train sets are needed to provide 5 traditional peak trips during the evening peak period.

4.4 CASE 3 - TRACK 2 ON TRACK 2

Case 3 focused on effects and benefits of improved infrastructure funded through the HSIPR Track 2 funding. By comparing and analyzing the dispatched results between Case 2 and Case 3, the overall strategic impact of the infrastructure improvements can be assessed and quantified.

4.4.1 Infrastructure Assumptions

All Track 2 infrastructure improvements in this Case were carefully reviewed against the final Track 2 project list prepared by Caltrans Division of Rail and modifications and assumptions were made where necessary. These changes are summarized below.

Table 4.4.1 – San Luis Obispo to Santa Barbara

Rank ID	Track 2 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
-	Santa Barbara County Tie Replacement	No MP locations provided	n/a

Table 4.4.2 – Santa Barbara to Los Angeles

Rank ID	Track 2 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
VC5	Track and Bridge Upgrades (Ventura County) Track 1+2; *No specific speeds or locations given to code into model.*	MP 426.4 and 441.9	n/a
VC1	Safety & Access Improvements to the Moorpark Station; *Improvements to eliminate of hold-out rule. Signals in the model were not originally coded north of Los Angeles Union Station and therefore improvements could not be tested in the model at this time.*	MP 427.1 and 427.25	n/a
LA1	Access & Safety Improvements at Burbank, Burbank Airport, Glendale Stations; *Projects involved station safety enhancements that could not be modeled, and station signals, which also could not be tested since signals were not originally coded north of Los Angeles Union Station.*	Ventura Subdivision MP 460.6 and Valley Subdivision MP 5.7	n/a
VC3	Highway Rail-Grade Crossing Safety Improvements (Ventura County)	MP 426.4 and MP 441.9	n/a
LA2	Highway Rail-Grade Crossing Safety Improvements (Los Angeles Co)	Ventura Subdivision MP 443.8 and Valley Subdivision MP 3.5	n/a
VC2	Signal/Wayside Detector Upgrades and Re-spacing (Ventura County); *Signals in the model were not originally coded north of Los Angeles Union Station and therefore could not be tested in the model at this time.*	MP 426.4 and 441.9	n/a
VC4	Signal or Communication Upgrades incl. Fiber & Microwave (Ventura County)	MP 426.4 and 441.9	n/a
LA4	Signal and Wayside Detector Upgrades and Re-spacing (LA County) Track 1+ 2; *Signals in the model were not originally coded north of Los Angeles Union Station and therefore could not be tested in the model at this time.*	Ventura Subdivision MP 441.9 and Valley Subdivision MP 3.5	n/a

Table 4.4.3 – Los Angeles to San Diego

Rank ID	Track 2 Infrastructure Improvement	Location within Mileposts (MP)	Figure Ref. Number
LA3	Signal and Communications Upgrade to improve safety and approach and departure speeds and capacity at LAUS.	MP 0.0 and MP 0.8	4.4.1

OC1	Irvine Third Main Line Track; *to include new universal crossovers at CP Tinkham, CP El Toro, MP 177.9, and MP 190.3*	MP 177.9 and 190.3	4.4.2
OC3	Santa Ana to San Juan Capistrano 110 MPH Upgrade	MP 176.1 and 197.0	n/a
SD4	San Diego LOSSAN CP San Onofre to CP Pulgas Double Track; *to include universal crossovers at San Onofre and Pulgas*	MP 212.3 and 218.1	4.4.3
SD7	San Diego LOSSAN Oceanside Station Stub Track - Project 2; *for Coaster*	MP 226.4 and 227.2	4.4.4
SD6	San Diego LOSSAN Carlsbad Double Track	MP 229.4 and 231.4	4.4.5
SD3	San Diego LOSSAN Poinsettia Station Run-Through Track	MP 233.0 and 234.4	4.4.6
SD11	San Diego LOSSAN CP Cardiff to CP Craven Double Track	MP 239.6 and 241.1	4.4.7
SD8	San Diego LOSSAN San Dieguito Bridge Replacement and Double Track / Del Mar Fairgrounds Permanent Seasonal Rail Platform	MP 242.2 and 243.3	4.4.8
SD8	San Diego LOSSAN Sorrento Valley Double Track	MP 247.7 and 249.0	4.4.9

Figure 4.4.1 – Upgrade to Improve Safety and Approach and Departure Speeds and Capacity at LAUS

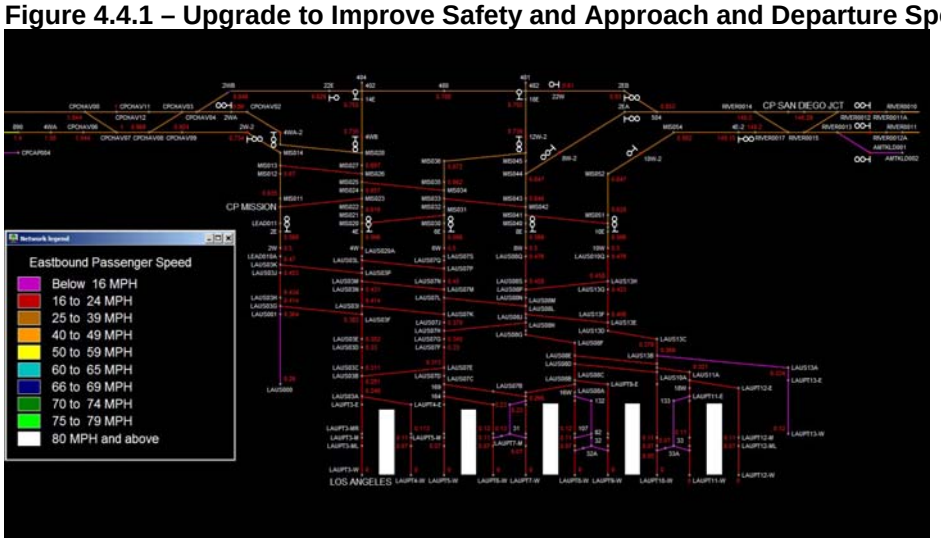


Figure 4.4.2 – Irvine Third Main Line Track

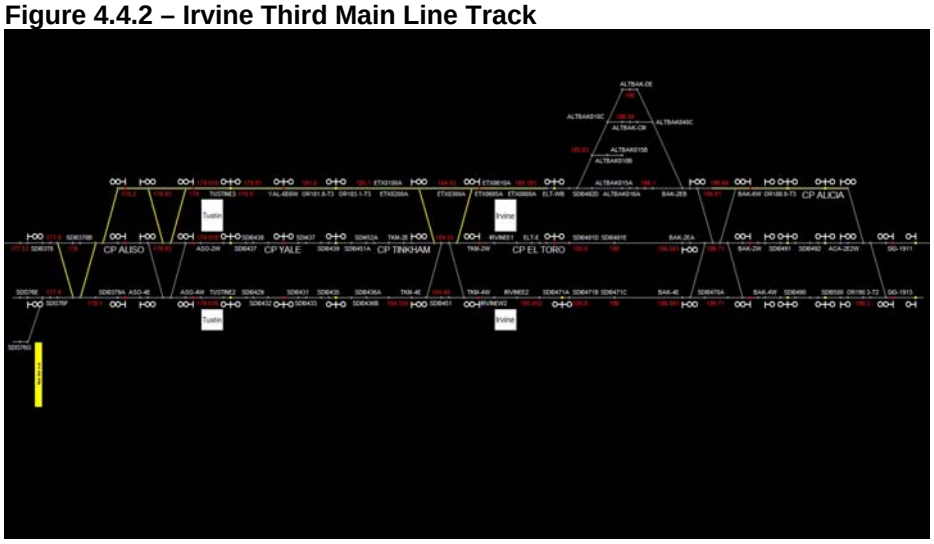


Figure 4.4.3 – San Diego LOSSAN CP San Onofre to CP Pulgas Double Track

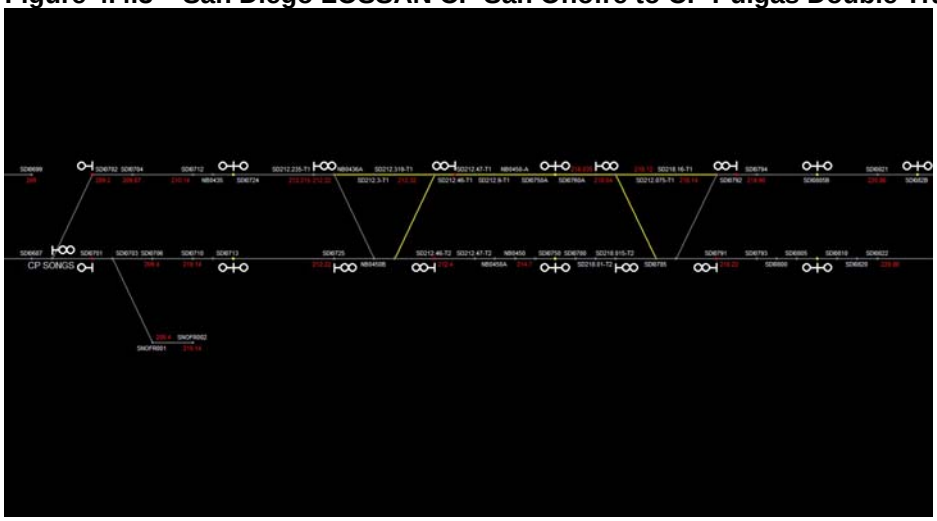


Figure 4.4.4 – San Diego LOSSAN Oceanside Station Stub Track - Project 2 (for Coaster)

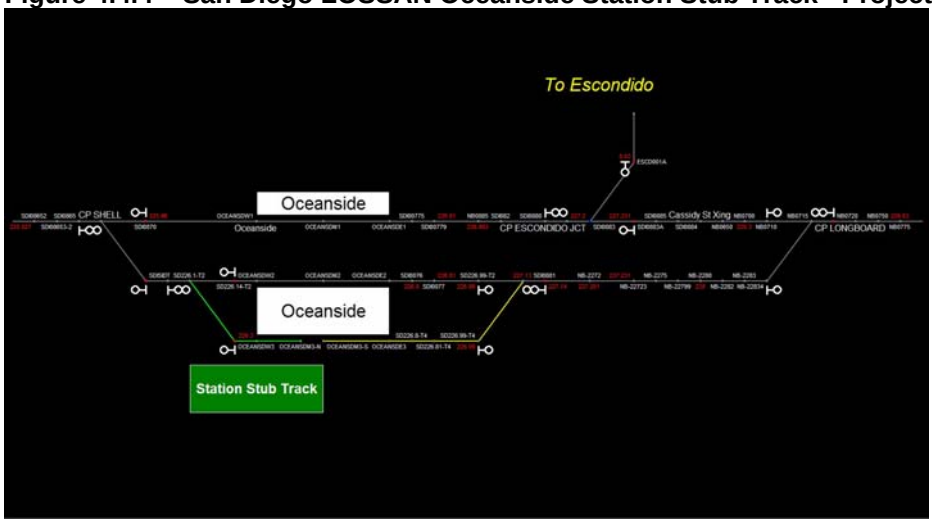


Figure 4.4.5 – San Diego LOSSAN Carlsbad Double Track

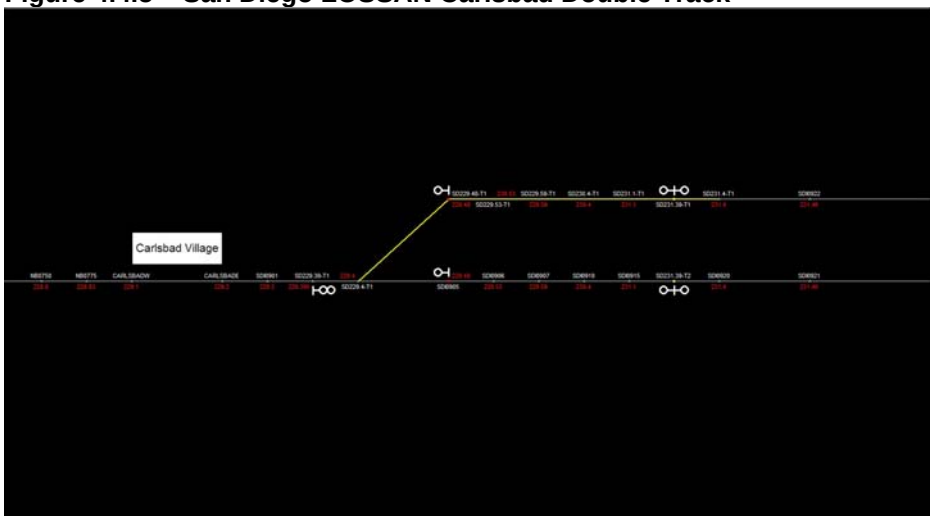


Figure 4.4.6 – San Diego LOSSAN Poinsettia Station Run-Through Track

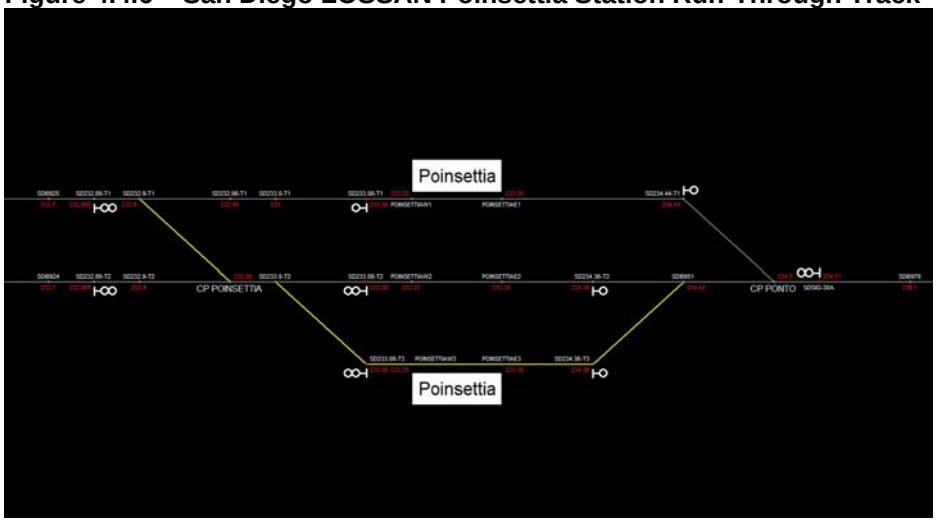


Figure 4.4.7 – San Diego LOSSAN CP Cardiff to CP Craven Double Track

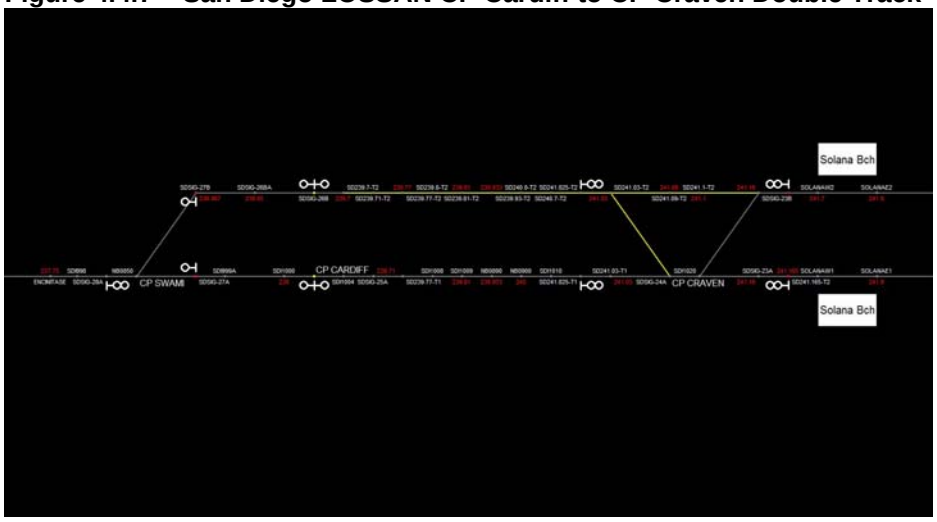


Figure 4.4.8 – San Dieguito Bridge Replacement and Double Track (and Seasonal Platform)

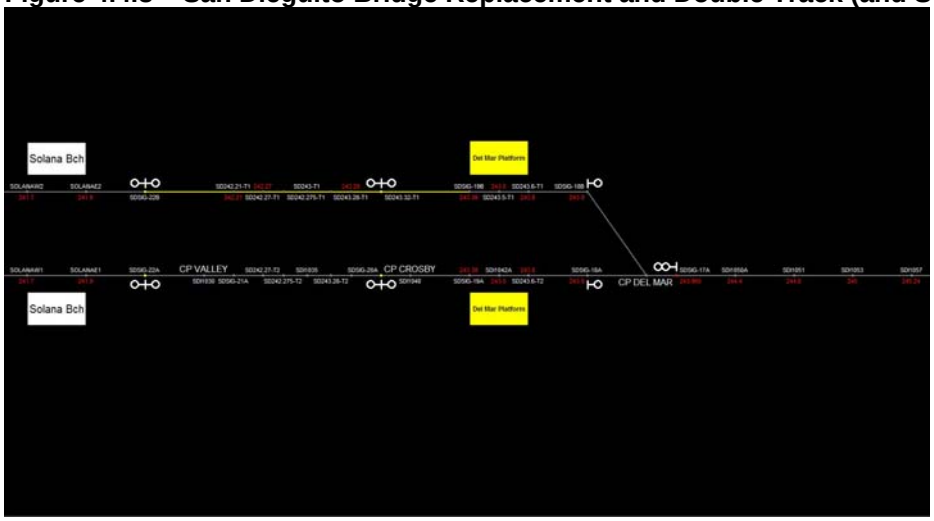
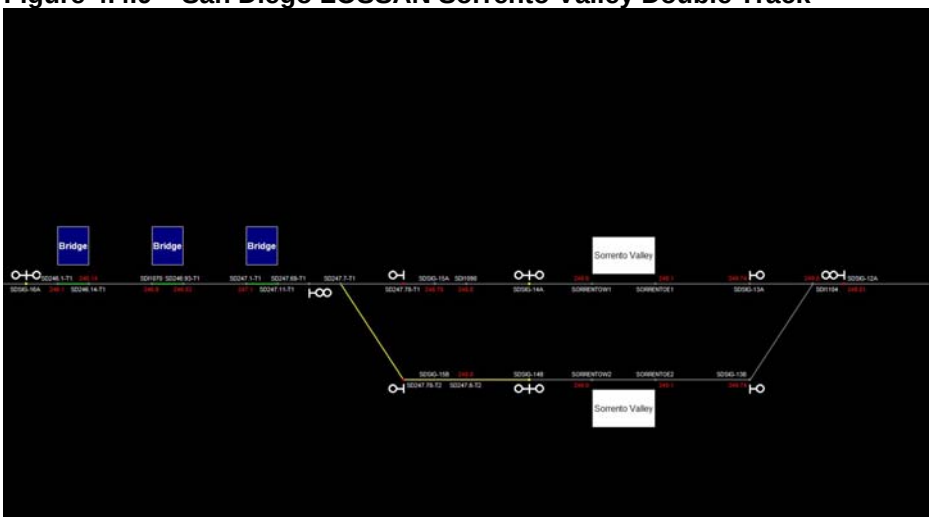


Figure 4.4.9 – San Diego LOSSAN Sorrento Valley Double Track



4.4.2 Operational Assumptions

Service levels are the same as what was assumed under Case 2 – Track 2 on Track 1. These assumptions reflect information provided by corridor agencies for year 2015/2016.

4.4.3 Model Output Results

As with Case 2, once the network was updated with the Track 2 projects and the model was calibrated, the analysis was conducted to determine how may of the conflicts observed in Case 2 were resolved by constructing the Track 2 projects, and where additional conflicts still remain. The observations made during this analysis are described below by intercity service segments.

San Luis Obispo to Santa Barbara

- Since there were no specific Track 2 projects that could be quantified to be incorporated into the model, no added track capacity was simulated in this segment and the overall operational condition was not changed from Case 2.

Santa Barbara to Los Angeles

- With limited Track 2 projects coded into the model for this analysis, the run-time results in the model output for trains between Goleta and LAUS are the same as Case 1 and 2, with a travel time between 2 hours and 30 minutes and 2 hours and 40 minutes with one-minute minimum station dwell time at all intermediate stations. This is significantly faster than the existing scheduled run-time between 2 hours and 50 minutes and 3 hours and 10 minutes, but it does not yet meet the target trip time of 2 hours, set by Caltrans Rail Division.

- Like the section north of Santa Barbara, there are no observed operational improvements from the Case 2 since there were no Track 2 projects that could be quantified in order to be incorporated into the model.

Los Angeles to San Diego

- LAUS becomes a critical bottleneck during peak periods because of the earlier arrival of trains due to the infrastructure improvements south of Los Angeles. The lack of alternative routes within the approach tracks is the major cause. While improvements to the speeds and approach tracks to LAUS are identified by Metrolink, specific improvements were not available at the time to be coded into the model, so these improvements could not be tested as part of this analysis. Speed improvements were assumed to be increased 5 MPH over existing. However, since specific improvements could not be incorporated into the model, there are several trains, particularly during the peak period, that were observed as delayed from being held on the approaches to the station until the tracks were cleared.

- The speed increases from 90 MPH to 110 MPH in Central Orange County between Tustin and Laguna Hills have a marginal benefit operationally, especially on southbound trains where maximum speed is not even reached due to the uphill grade between Santa Ana and Irvine stations. Though the increased speed creates additional pad time, just a few northbound Amtrak trains which do not stop at Laguna Niguel/Mission Viejo or Tustin stations can actually reach the new MAS of 110 MPH in the segment after departing Irvine, due to the downhill grade to Santa Ana.

- The new triple-track section between Tustin and Mission Viejo does provide additional track capacity, but will be challenging to utilize as an overtake location because of the existing and modified service plan and infrastructure of the surrounding area. The signal block layout does not allow two trains running in close proximity adequate time to overtake each other. This is because the existing and projected infrastructure does not allow trains to run closer than 5-minute headways and all trains stop at the Irvine Station. Due to these limitations, faster trains cannot shorten the headway to complete the overtake before reaching to the end of the triple-track section. However, having infrastructure in this segment would be beneficial assuming a new service plan is developed that takes into account the changes in the operations provided by express versus local service and the ability for Metrolink and Coaster trains to now allow transfers as a result of the Oceanside stub tracks.

- Based on the model output, the travel times for the Pacific Surfliner (both express and local) do show measurable improvement of approximately 10 minutes for local trains and 20 to 25 minutes for express trains, over existing scheduled times. However, due to remaining capacity constraints and limited locations for overtakes, this improvement in travel time still falls short of the ultimate goal set by Caltrans Rail Division of less than 2 hours between Los Angeles and San Diego.

- The new stub track at Oceanside Station for Coaster trains will have an operational benefit that allows two trains to meet and pass at Oceanside while a Coaster train turns. This also helps reduce the traffic volume and increase the operational flexibility in the segment between Oceanside Station and Stuart Mesa Yard by reducing the deadhead movements occurred by inadequate turnback capacity at the Oceanside Station.

- The congestion in the segment between the Orange/San Diego County Line and the Oceanside Station is eased by the elimination of single-track between CP San Onofre and CP Pulgas. However, the remaining single-track section between CP Eastbrook and CP Shell remains a bottleneck.

- A new run-through track at Carlsbad Poinsettia Station allows meets and overtakes at the same time. The overall benefits are realized when Surfliner Express trips are able to overtake Coaster commuter trains at this location, therefore maintaining their speed and on-time performance.

5.0 CONCLUSION

Based on the analysis of these three different cases with different service and infrastructure levels, the infrastructure projects identified for HSIPR Track 2 funding on the LOSSAN corridor are sufficient to accommodate the proposed number of trains assumed for 2015. The observations and analysis performed show that the infrastructure upgrades, especially ones in segment south of LAUS would be most effective in improving the on-time performance of all passenger services on the corridor. It can be assumed at this time however that given the lack of specific information north of LAUS needed for coding into the model, the full effectiveness of the Track 2 projects north of Los Angeles might not be fully realized.

However, the projects identified in this analysis do prepare the corridor for speed increases and trip time reductions. This iterative series of improvements will enhance conventional passenger rail operations and safety. The completed Track 1 and 2 projects can serve as an effective platform for redefining service along the LOSSAN corridor, consistent with the strategic goals established in the State Rail Plan and providing convenient connections to the Statewide High Speed Rail network. The quality of life in the region will also benefit from an enhancement intercity transportation system that can provide more travel options for commuters and leisure travelers alike.

Once completed, the projects identified in this report will be the culmination of a fully realized regional rail transportation system that would effectively link improved conventional and emerging high speed rail operations to the California High Speed Train system thereby creating an integrated statewide rail network. The multi-billion dollar investment into the Southern California regional rail infrastructure will be the basis for rail to compete effectively and decisively with both highway and air transportation modalities. The resulting benefits will satisfy the goals set out by both the Federal and State Rail Plans:

- Safety
- Reliability
- Jobs and Economic Stimulus
- Intermodal Connectivity
- Sustainability
- Increased Service and Reliability
- Strategic Integration with Statewide Plans

5.1 FUTURE RECOMMENDATIONS

While the Track 1 and 2 infrastructure configurations identified in this report were observed as being able to support the proposed year 2015/16 service levels, due diligence requires us to point out that daily railroad operations are extremely fluid and our simulations indicate that additional infrastructure projects are needed to further optimize operations along the entire LOSSAN corridor in order to establish a robust operation capable of quickly recovering from unplanned conflicts, delays or incidents. These recommendations are broken down by intercity service segments on the corridor and listed below:

San Luis Obispo to Santa Barbara

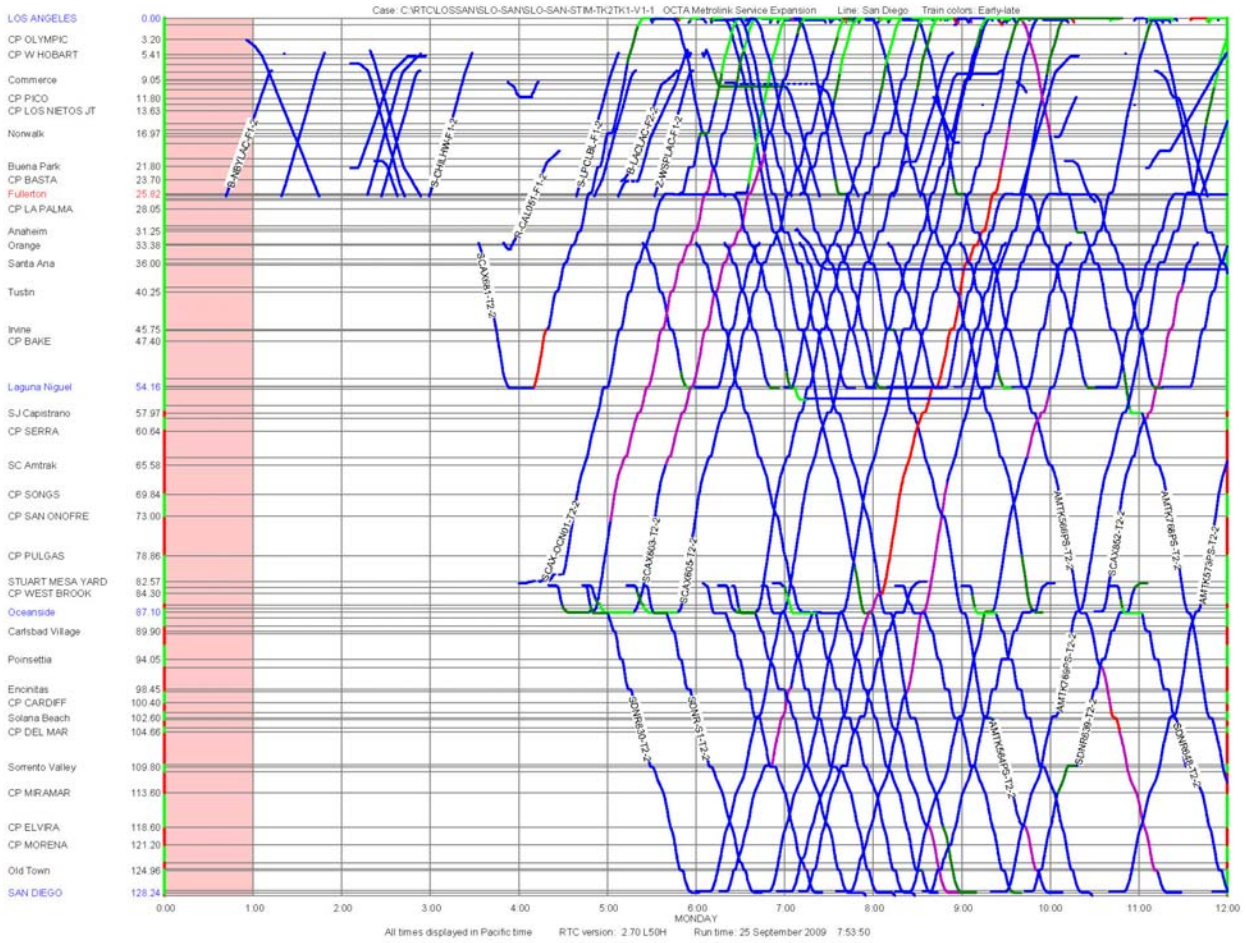
- Additional siding rehabilitation projects, possibly Waldorf Siding

Santa Barbara to Los Angeles

- Second platform at Oxnard Station (on siding track)
- Extension of Santa Susana Siding from CP Santa Susana to Simi Valley Station with the second platform at the station
- Extension of Camarillo Siding to Leesdale Siding and upgrade of Leesdale to CTC.
- Elimination of single-track section between CP Raymer and CP De Soto
- Second platform (on Main Track 1) at Van Nuys Station

Los Angeles to San Diego

- Additional train layup capacity in Downtown San Diego to accommodate increased peak-period Coaster service
- Significant reduction of the single-track section between CP Serra and CP Songs
- Sorrento to Miramar Double Track Project Phase II to eliminate the single-track section between Sorrento Siding and CP Miramar while realigning the track to eliminate steep curves and grades
- Signal re-spacing near overtake locations, namely in segments between Fullerton and Red Hill Avenue in Tustin, near Poinsettia Station siding, and near Solana Beach Station to allow shorter headway
- Signal re-spacing between LAUS and Redondo Junction to allow train departure and arrival in shorter headway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Anaheim 31.25
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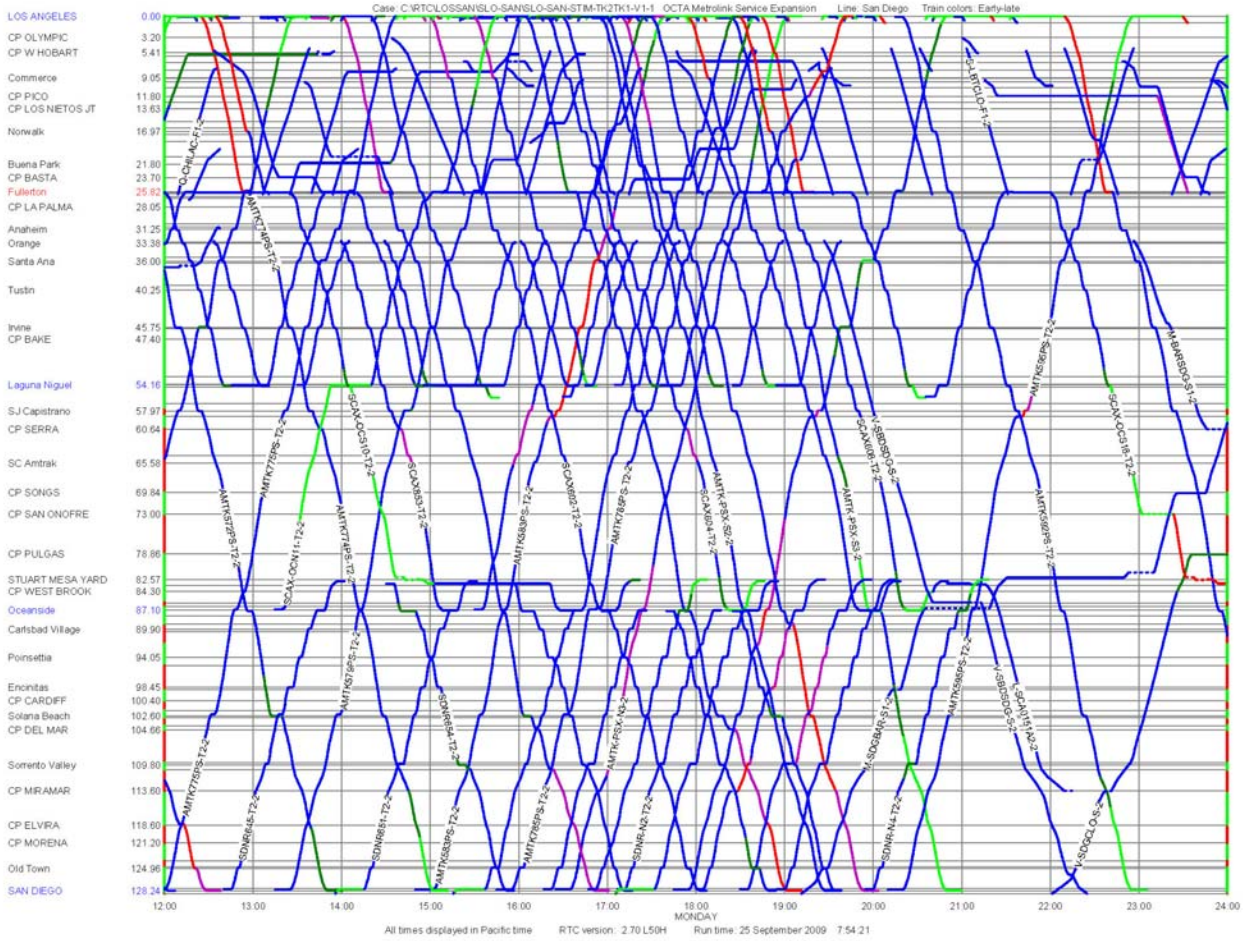
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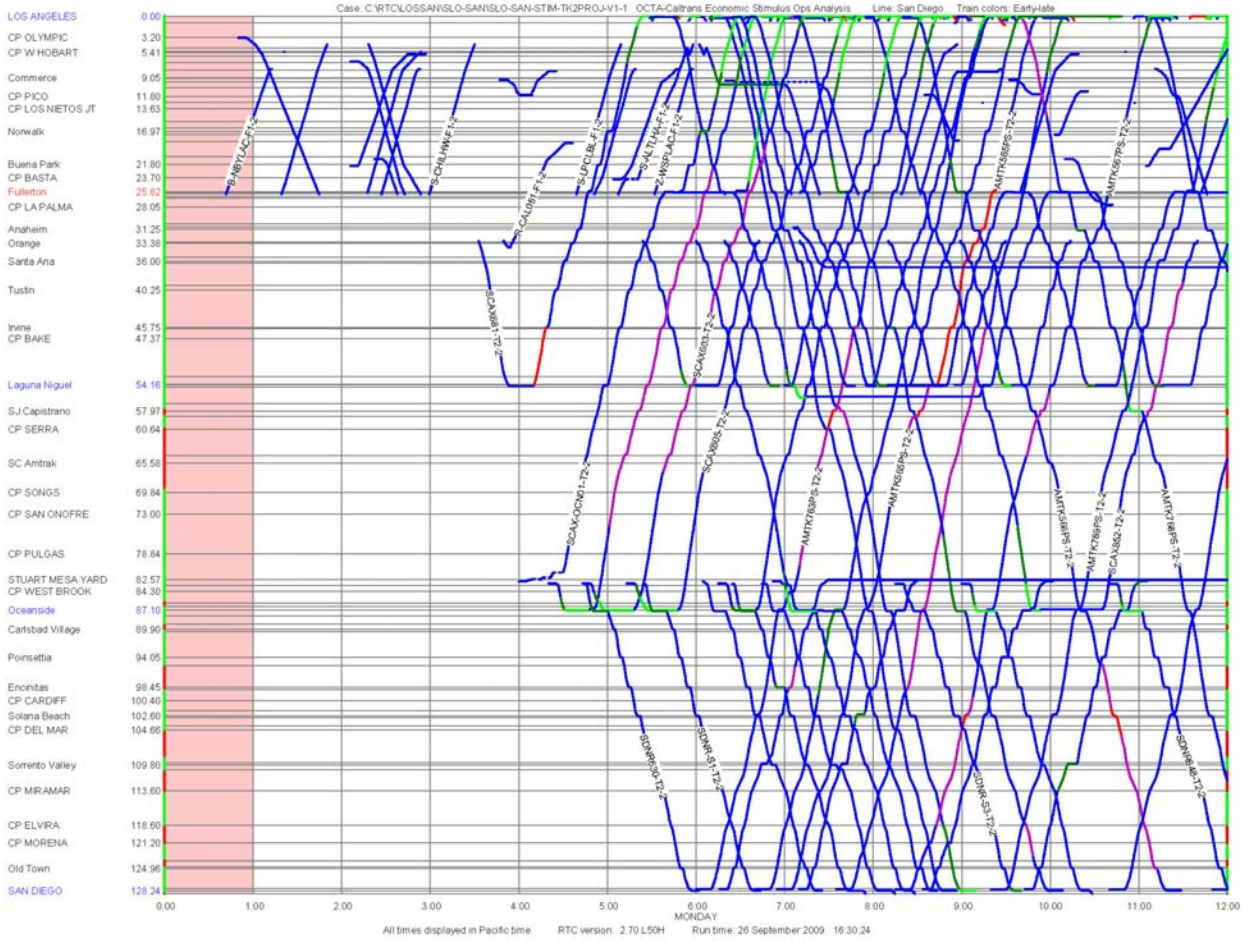
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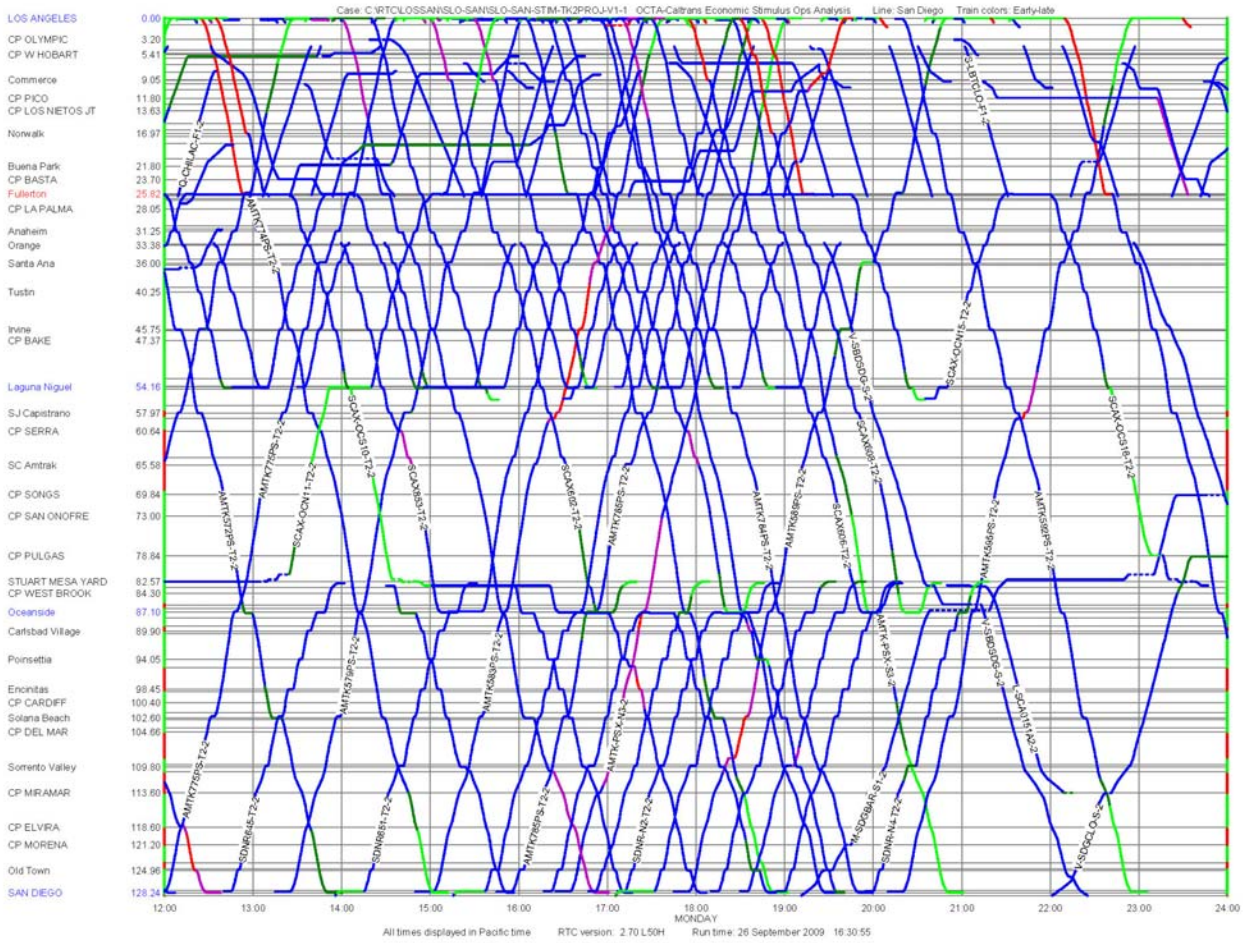
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Appendix B: Rail Stations and Connecting Transit Services

B.1 Introduction

Amtrak and joint use rail stations (intercity and commuter) are listed geographically from north to south. Descriptions include connections to other Amtrak trains, Amtrak Thruway buses, commuter rail, local transit serving the rail stations and privately operated transportation services. All connecting public services are scheduled services unless otherwise noted.

B.2 Rail Stations

San Luis Obispo - The Coast Starlight, Pacific Surfliner trains, Pacific Surfliner and San Joaquin Thruway buses, and San Luis Obispo Regional Transit Authority regional transit serve this station. Ride On Shuttle and Silverado Stages shuttle vans, two taxi services, and car rentals are available with advance reservation.

Grover Beach – Pacific Surfliner trains, Pacific Surfliner and San Joaquin Route Thruway buses, San Luis Obispo Regional Transit Authority, and South Coast Area Transit serve the station. Ride On Shuttles, taxis, and car rentals are available with advance notice.

Guadalupe – Pacific Surfliner trains and San Joaquin Thruway buses and the local bus Guadalupe Flyer serve the station. A taxi and car rentals are available with advance reservation.

Surf/Lompoc – Pacific Surfliner trains serve this station. Lompoc Taxi and car rentals are available with advance notice.

Goleta – Pacific Surfliner trains and San Joaquin Thruway buses serve the station. Santa Barbara MTD local bus stops about one-half mile from the station. The University of California at Santa Barbara offers a free taxi shuttle between the station and the university campus to qualified students and employees through pre-registration. Super Ride Shuttle and Tours shuttle van, taxi, and car rentals are available with advance notice.

Santa Barbara –The Coast Starlight, Pacific Surfliner trains, connecting Pacific Surfliner and San Joaquin Thruway buses, and Santa Barbara MTD local transit serve the station. Super Ride Airport Shuttle and Santa Barbara Airbus shuttle vans are available with advance reservation, as are two taxi services and car rentals.

Carpinteria – The Pacific Surfliner train, Pacific Surfliner and San Joaquin Thruway buses, Santa Barbara MTD and Vista Express local buses serve the station, as well as Super Ride Shuttle vans, a taxi, and a car rental service with advance reservation.

Ventura – Pacific Surfliner rail service, San Joaquin and Pacific Surfliner Thruway buses, Gold Coast Transit local transit, Roadrunner shuttle and Ventura County Airporter advance-reservation shuttle vans, a taxi, and car rental agencies serve the station.

Oxnard –The Coast Starlight, Pacific Surfliner trains, Metrolink, San Joaquin and Pacific Surfliner Thruway buses, Greyhound, and Cold Coast Transit and Dial-A-Ride local transit serve this station, as well as Roadrunner Shuttle, Amadenz Taxi & Limo Service and Ventura County Airporter advance-reservation shuttles, three taxi services, and rental cars.

Camarillo – is served by Pacific Surfliner trains, Metrolink commuter trains, Camarillo Area Transit, Gold Coast Transit and Ventura Intercity Service Transit Authority (local transit which includes service to the California State University Channel Islands campus), advance reservation Roadrunner Shuttle, taxi, and one car rental company.

Moorpark – Pacific Surfliner trains, Metrolink trains, one daily Pacific Surfliner Thruway bus, and Moorpark City Transit serve the station, as well as one advance-reservation taxi and car rentals.

Simi Valley – The Coast Starlight, Pacific Surfliner trains, Metrolink trains, San Joaquin and Pacific Surfliner Thruway buses, and Simi Valley Transit serve the station; also, two advance-reservation airport shuttles (Airport Service and Airport Shuttle), two taxi companies, and car rentals.

Chatsworth –Served by Pacific Surfliner trains, Metrolink commuter rail, Pacific Surfliner and San Joaquin Thruway buses, and Metro Buses, Simi Valley Transit, Santa Clarita Transit, two advance-reservation taxi companies, and car rentals.

Van Nuys – The station is a hub for Amtrak in the San Fernando Valley. The Coast Starlight, Pacific Surfliner trains, Metrolink commuter trains, Pacific Surfliner and San Joaquin Thruway buses, DASH, Metro Buses, R&D Transportation and Super Shuttle advance-reservation shuttles, three taxi services, and car rentals serve this station.

Burbank-Bob Hope Airport – This is the first station in the West to provide a direct pedestrian link between intercity passenger rail and international airport services. Pacific Surfliner and Metrolink trains, San Joaquin Thruway buses, Metro Bus, Burbank Local Transit, a free platform/airport terminal shuttle bus, and Prime Time Shuttle and Super Shuttle advance-reservation vans serve this station. Two taxi services are available on the islands in front of the airport terminal, and numerous car rentals are available.

Glendale –The station is served by the Pacific Surfliner trains, Metrolink commuter rail service, connecting Pacific Surfliner and San Joaquin Thruway buses, Greyhound, Metro and Glendale Beeline local transit buses, as well as advance-reservation Dani's Shuttle and Glendale Airport Van shuttle vans, two taxis, and car rentals.

Los Angeles – The historic Los Angeles Union Station (LAUS) serves as Amtrak's western United States transcontinental hub. The Coast Starlight, Pacific Surfliner, Southwest Chief, Sunset Limited intercity trains, Metrolink commuter rail, local Metro Red Line (subway) and Gold Line (light rail), San Joaquin and Pacific Surfliner Thruway buses, and 12 local transit agencies' buses serve the station. Los Angeles Airport FlyAway express buses offer frequent 24-hours/day service directly to Los Angeles International Airport from Union Station. There are also three other shuttle services and two waiting taxi services at the station, and car rental agencies are located within the terminal.

Fullerton –Amtrak's Southwest Chief long distance train, the Pacific Surfliners, Metrolink commuter rail, and Pacific Surfliner and San Joaquin Thruway buses serve the station. Across the street, Orange County Transportation Authority has a bus stop. LAX Express Shuttle and Titan Shuttle to the California State University Fullerton campus are available by advance reservation. One advance-reservation taxi service and car rentals are available.

Anaheim – This station is located within the Angel Stadium parking lot in Anaheim. It is served by Pacific Surfliner trains, Metrolink commuter rail, San Joaquin Thruway buses, Orange County Transportation Authority buses, a direct shuttle to Disneyland, and two other shuttles, all requiring advance-reservations. Two taxi services and rental cars are available.

Santa Ana –This station is served by Pacific Surfliner trains, Metrolink commuter rail, San Joaquin Thruway buses, Greyhound, Orange County Transportation Authority buses, Super Shuttle and Airport Bus advance-reservation shuttles, two taxis, and car rentals.

Irvine –The station is served by Pacific Surfliner trains, Metrolink, Orange County Transportation Authority buses, Super Shuttle and UC Irvine vanpool advance-reservation vans, two taxi services, and car rentals.

San Juan Capistrano – The station is served by Pacific Surfliner trains, Metrolink,

San Joaquin Thruway buses, Orange County Transportation Authority buses, Superior Shuttle advance-reservation vans, two taxis, and rental cars.

San Clemente Pier – The station is served by selected Pacific Surfliner trains, peak season Orange County Transportation Authority buses, advance-reservation HMS Town Car and Prime Time Shuttle vans, a taxi, and rental cars.

Oceanside – The station is served by Pacific Surfliner trains, COASTER and Metrolink commuter rail trains, San Joaquin Thruway buses, Greyhound, and North County Transit District (NCTD) Sprinter trains to California State University San Marcos, NCTD buses, advance-reservation PAL Shuttle Service, Cloud 9 Shuttle and Prime Ride Shuttle vans, two taxis, and car rentals.

Solana Beach – This station is served by Pacific Surfliner trains, the COASTER commuter rail, San Joaquin Thruway buses, North County Transit District buses, Zephyr Transportation Service advance-reservation shuttle, three taxi services, and rental cars.

Old Town – This station is served by three weekend-only Pacific Surfliner trains in each direction. The last southbound Pacific Surfliner train discharges passengers at Old Town to facilitate late night transit connections. The station also serves COASTER commuter rail, San Diego Trolley, and local transit buses.

San Diego – This station is located in downtown San Diego. It is served by Pacific Surfliner trains, COASTER commuter trains, San Joaquin Thruway buses, the San Diego Trolley, and San Diego Transit, Premier Ride and Cloud 9 Shuttle advance-reservation vans, two waiting taxi services, and car rentals.

* End of *Pacific Surfliner* SDP *